



# **Parklane and Victor Elementary Schools - HVAC Replacement MANUAL**

**CONTRACT NUMBER: 3213-4416-2**

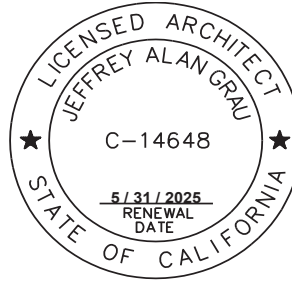
**Heating Ventilation Air Conditioning  
Replacement**

**LODI UNIFIED SCHOOL DISTRICT**

**October 10, 2023**

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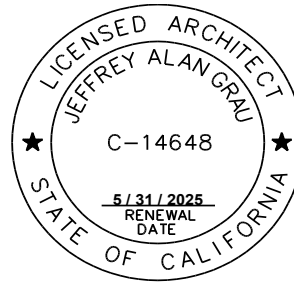
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<b>VICTOR ELEMENTARY SCHOOL</b>
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**STRUCTURAL**

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**LIST OF SCHEDULES**

The following schedule summarizes the major activity dates (Dates are approximate and actual start dates are subject to change):

a. Bid Dates

- |                              |                  |
|------------------------------|------------------|
| 1) Advertise to Bid (first)  | October 10, 2023 |
| 2) Advertise to Bid (second) | October 17, 2023 |
| 3) Pre-Bid Conference        | October 19, 2023 |
| 4) Addendum (last)           | October 26, 2023 |
| 5) Bids Due                  | October 30, 2023 |
| 6) Board Award               | November 7, 2023 |

b. Contracts

- |                       |                       |
|-----------------------|-----------------------|
| 1) Bond Preparation   | November 8 - 15, 2023 |
| 2) Contract Execution | November 16, 2023     |

c. Pre-Construction Activities

- |                                   |                             |
|-----------------------------------|-----------------------------|
| 1) Start Date                     | November 20, 2023           |
| 2) Submittals and Approvals       | Nov 20, 2023 - Jan 20, 2024 |
| 3) Materials Ordering/Stockpiling | December 2023 - May 2024    |
| 4) School Concludes for Summer    | May 31, 2024                |

d. Construction

- |  |                              |
|--|------------------------------|
| 1) Date of facility availability         | June 1, 2024                 |
| 2) Construction, All Units               | June 1, 2024 - July 23, 2024 |
| 3) Begin turning over spaces to District | July 17, 2024                |

e. Occupancy: In order to accommodate a phased occupancy by the Owner, the Contractor will turn the buildings over for occupancy as follows:

- |                         |                |
|-------------------------|----------------|
| 1) Occupancy - Staff    | July 24, 2024  |
| 2) Occupancy - Students | August 1, 2024 |

f. Completion/Close-out

- |                                |                 |
|--------------------------------|-----------------|
| 1) Substantial Completion Date | July 17, 2024   |
| 2) Complete Minor Finish Work  | July 31, 2024   |
| 3) Complete Punch List Work    | July 31, 2024   |
| 4) Closeout/Completion         | August 31, 2024 |

END OF DOCUMENT

**NOTICE TO BIDDERS**

1. Notice is hereby given that the governing board ("Board") of the Lodi Unified School District ("District") will receive sealed bids for the following project, Bid No. 3213-4416-1, Bid Package for construction of Parklane and Victor Elementary Schools - HVAC Replacement. ("Project" or "Contract"):

The Project consists of: **Parklane and Victor Elementary Schools - HVAC Replacement**

2. To bid on this Project, the Bidder is required to possess one or more of the following State of California contractors' license(s):

Classification of Contractor's License for this work shall be Class **B, General Building, C-20, Warm-Air Heating, Ventilating & Air Conditioning.**

The Bidder's license(s) must remain active and in good standing throughout the term of the Contract.

3. To bid on this Project, the Bidder is required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code. In accordance with the provisions of Section 1770 and 1773 of the Labor Code, owner has obtained from the Director of the Department of Industrial Relations, the general prevailing rate of wages applicable to the work to be done.
4. Contract Documents will be available on or after **October 10, 2023**, for review at the District Facilities Office, and may be downloaded from the District's website, using the <https://www.lodiUSD.net/district/departments/business-services/facilities-and-planning/fp-projects> link. In addition, Contract Documents are available for bidders' review at the following builders' exchanges:

- A. Builder's Exchange of Stockton
- B. Builders Exchange of San Joaquin County
- C. Valley Builders Exchange
- D. Central California Builders Exchange

5. Sealed bids will be received until 10:00a.m., October 30, 2023, at the District Facilities Office, 880 N. Guild Avenue, Lodi California 95240 at or after which time the bids will be opened and publicly read aloud. Any bid that is submitted after this time shall be nonresponsive and returned to the bidder. Any claim by a bidder of error in its bid must be made in compliance with section 5100 et seq. of the Public Contract Code.

Pursuant to Public Contract Code §20111.6, effective January 1, 2014, school districts are required to conduct a prequalification process for General Contractors, and Mechanical, Electrical and Plumbing Subcontractors for projects over \$1,000,000. Only those contractors who submitted a prequalification application in 2023 and were notified that they qualified may submit bids on this project. All bids shall be on the form

provided by the District. Each bid must conform and be responsive to all pertinent Contract Documents, including, but not limited to, the Instructions to Bidders.

6. A bid bond by an admitted surety insurer on the form provided by the District a cashier's check or a certified check, drawn to the order of the Lodi Unified School District, in the amount of ten percent (10%) of the total bid price, shall accompany the Bid Form and Proposal, as a guarantee that the Bidder will, within seven (7) calendar days after the date of the Notice of Award, enter into a contract with the District for the performance of the services as stipulated in the bid.
7. **A mandatory pre-bid conference and site visit will be held on October 19, 2023 at 2:00pm at Victor Elementary School at 17670 Bruella Road, Victor, California.** All participants are required to meet at the Flag Pole and sign in with District Staff. Failure to attend or tardiness will render bid ineligible.
8. The successful Bidder shall be required to furnish a 100% Performance Bond and a 100% Payment Bond if it is awarded the Contract for the Work.
9. The successful Bidder may substitute securities for any monies withheld by the District to ensure performance under the Contract, in accordance with the provisions of section 22300 of the Public Contract Code.
10. The successful bidder will be required to certify that it either meets the Disabled Veteran Business Enterprise ("DVBE") goal of three percent (3%) participation or made a good faith effort to solicit DVBE participation in this Contract if it is awarded the Contract for the Work.
11. The Contractor and all Subcontractors under the Contractor shall pay all workers on all Work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to section 1770 et seq. of the California Labor Code. Prevailing wage rates are also available from the District or on the Internet at: <http://www.dir.ca.gov>.
12. This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and subject to the requirements of Title 8 of the California Code of Regulations. The successful Bidder shall comply with all requirements of Division 2, Part 7, Chapter 1, Articles 1-5 of the Labor Code.
13. The Project is funded in whole or in part with federal funds, and therefore the Contractor shall comply with the Davis-Bacon Act, applicable reporting requirements, and any other applicable requirements for federal funding. This Project is also subject to Buy American requirements.
14. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on:

B. The base bid amount only.



15. The Board reserves the right to reject any and all bids and/or waive any irregularity in any bid received. If the District awards the Contract, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

**INSTRUCTIONS TO BIDDERS**

Bidders shall follow the instructions in this document, and shall submit all documents, forms, and information required for consideration of a bid.

Lodi Unified School District ("District") will evaluate information submitted by the apparent low Bidder and, if incomplete or unsatisfactory to District, Bidder's bid may be rejected at the sole discretion of District.

1. Bids are requested for a general construction contract, or work described in general, for the following project ("Project" or "Contract"):

**Parklane and Victor Elementary Schools - HVAC Replacement**

2. A Bidder and its subcontractors must possess the appropriate State of California contractors' license and must maintain the license throughout the duration of the project. Bidders must also be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code. Bids submitted by a contractor who is not properly licensed or registered shall be deemed nonresponsive and will not be considered.
3. Pursuant to Public Contract Code §20111.6, effective January 1, 2014, school districts are required to conduct a prequalification process for General Contractors, and Mechanical, Electrical and Plumbing Subcontractors for **projects over \$1,000,000**. Only those contractors who submitted a prequalification application in 2023 and were notified that they qualified may submit bids on this project. Prequalification can be completed on the PQBids website using <https://pqbids.com/lodi/>. Only prequalified bidders will be eligible to submit a bid for this Project. Any bid submitted by a bidder who is not prequalified shall be deemed nonresponsive and will not be considered.
4. District will receive sealed bids from bidders as stipulated in the Notice to Bidders.
  - a. All bids must be sealed in an envelope, marked with the name and address of the Bidder, name of the Project, the Project Number and/or bid number, and time of bid opening.
  - b. Bids must be submitted to the District **Facilities and Planning Office, 880 N. Guild Avenue, Lodi California 95240** by date and time shown in the Notice to Bidders.
  - c. Bids must contain all documents as required herein.
5. Bidders are advised that on the date that bids are opened, telephones will not be available at the District Offices for use by bidders or their representatives.
6. Bids will be opened at or after the time indicated for receipt of bids.
7. Bidders must submit bids on the documents titled Bid Form and Proposal and must submit all other required District forms. Bids not submitted on the District's required

forms shall be deemed nonresponsive and shall not be considered. Additional sheets required to fully respond to requested information are permissible.

8. Bidders shall not modify the Bid Form and Proposal or qualify their bids. Bidders shall not submit to the District a re-formatted, re-typed, altered, modified, or otherwise recreated version of the Bid Form and Proposal or other District-provided document.
9. Bids shall be clearly written and without erasure or deletions. District reserves the right to reject any bid containing erasures, deletions, or illegible contents.
10. Bidders must supply all information required by each Bid Document. Bids must be full and complete. District reserves the right in its sole discretion to reject any bid as nonresponsive as a result of any error or omission in the bid. Bidders must complete and submit all of the following documents with the Bid Form and Proposal:
  - a. Bid Bond on the District's form, or other security.
  - b. Designated Subcontractors List.
  - c. Site Visit Certification, if a site visit was required.
  - d. Non-Collusion Declaration.
  - e. Iran Contracting Act Certification, if contract value is \$1,000,000 or more.
11. Bidders must submit with their bids cash, a cashier's check or a certified check payable to District, or a bid bond by an admitted surety insurer of not less than ten percent (10%) of amount of Base Bid, plus all additive alternates ("Bid Bond"). If Bidder chooses to provide a Bid Bond as security, Bidder must use the required form of corporate surety provided by District. The Surety on Bidder's Bid Bond must be an insurer admitted in the State of California and authorized to issue surety bonds in the State of California. Bids submitted without necessary bid security will be deemed nonresponsive and will not be considered.
12. If Bidder to whom the Contract is awarded fails or neglects to enter into the Contract and submit required bonds, insurance certificates, and all other required documents, within **SEVEN (7)** calendar days after the date of the Notice of Award, District may deposit Bid Bond, cash, cashier's check, or certified check for collection, and proceeds thereof may be retained by District as liquidated damages for failure of Bidder to enter into Contract, in the sole discretion of District. It is agreed that calculation of damages District may suffer as a result of Bidder's failure to enter into the Contract would be extremely difficult and impractical to determine and that the amount of the Bidder's required bid security shall be the agreed and conclusively presumed amount of damages.
13. Bidders must submit with the bid the Designated Subcontractors List for those subcontractors who will perform any portion of Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in excess of one half of one percent (0.5%) of total bid. Failure to submit this list when required by law shall result in bid being deemed nonresponsive and the bid will not be considered.

14. All of the listed subcontractors are required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code.
  - a. An inadvertent error in listing the California contractor license number on the Designated Subcontractors List shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the correct contractor's license number is submitted to the District within 24 hours after the bid opening and the corrected number corresponds with the submitted name and location for that subcontractor.
  - b. An inadvertent error listing an unregistered subcontractor shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive provided that any of the following apply:
    - (1) The subcontractor is registered prior to the bid opening.
    - (2) The subcontractor is registered and has paid the penalty registration fee within 24 hours after the bid opening.
    - (3) The subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
15. If a mandatory pre-bid conference and site visit ("Site Visit") is required as referenced in the Notice to Bidders, then Bidders must submit the Site Visit Certification with their Bid. District will transmit to all prospective Bidders of record such Addenda as District in its discretion considers necessary in response to questions arising at the Site Visit. Oral statements shall not be relied upon and will not be binding or legally effective. Addenda issued by the District as a result of the Site Visit, if any, shall constitute the sole and exclusive record and statement of the results of the Site Visit.
16. Bidders shall submit the Non-Collusion Declaration with their bids. Bids submitted without the Non-Collusion Declaration shall be deemed nonresponsive and will not be considered.
17. The Contractor and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to the Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code. Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the Contract, as determined by Director of the Department of Industrial Relations, are available upon request at the District's principal office. Prevailing wage rates are also available on the internet at <http://www.dir.ca.gov>.

Since the Project is funded in whole or in part with federal funds, the Contractor and all Subcontractors under the Contractor shall comply with the Davis-Bacon Act, applicable reporting requirements, and any other applicable requirements for federal funding. If a conflict exists with a state requirement, the more stringent provision shall control.

18. Section 17076.11 of the Education Code requires school districts using funds allocated pursuant to the State of California School Facility Program for the construction and/or modernization of school building(s) to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%) per year of the overall dollar amount expended on projects that receive state funding or demonstrate its good faith effort to solicit DVBE participation in this Contract. In order to meet this requirement by demonstrating a good faith effort, Bidder must advertise for DVBE-certified subcontractors and suppliers before submitting its Bid. For any project that is at least partially state-funded, the lowest responsive responsible Bidder awarded the Contract must submit certification of compliance with the procedures for implementation of DVBE contracting goals with its signed Agreement. DVBE Certification form is attached. Do not submit this form with your Bid.
19. Submission of bid signifies careful examination of Contract Documents and complete understanding of the nature, extent, and location of Work to be performed. Bidders must complete the tasks listed below as a condition to bidding, and submission of a bid shall constitute the Bidder's express representation to District that Bidder has fully completed the following:
- a. Bidder has visited the Site, if required, and has examined thoroughly and understood the nature and extent of the Contract Documents, Work, Site, locality, actual conditions, as-built conditions, and all local conditions and federal, state and local laws, and regulations that in any manner may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto;
  - b. Bidder has conducted or obtained and has understood all examinations, investigations, explorations, tests, reports, and studies that pertain to the subsurface conditions, as-built conditions, underground facilities, and all other physical conditions at or contiguous to the Site or otherwise that may affect the cost, progress, performance, or furnishing of Work, as Bidder considers necessary for the performance or furnishing of Work at the Contract Sum, within the Contract Time, and in accordance with the other terms and conditions of Contract Documents, including specifically the provisions of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies, or similar information or data are or will be required by Bidder for such purposes;
  - c. Bidder has correlated its knowledge and the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents;
  - d. Bidder has given the District prompt written notice of all conflicts, errors, ambiguities, or discrepancies that it has discovered in or among the Contract Documents and the actual conditions, and the written resolution(s) thereof by the District is/are acceptable to Bidder;
  - e. Bidder has made a complete disclosure in writing to the District of all facts bearing upon any possible interest, direct or indirect, that Bidder believes any representative of the District or other officer or employee of the District

presently has or will have in this Contract or in the performance thereof or in any portion of the profits thereof;

- f. Bidder must, prior to bidding, perform the work, investigations, research, and analysis required by this document and that Bidder represented in its Bid Form and Proposal and the Agreement that it performed prior to bidding. Contractor under this Contract is charged with all information and knowledge that a reasonable bidder would ascertain from having performed this required work, investigation, research, and analysis. Bid prices must include entire cost of all work "incidental" to completion of the Work.
- g. Conditions Shown on the Contract Documents: Information as to underground conditions, as-built conditions, or other conditions or obstructions, indicated in the Contract Documents, e.g., on Drawings or in Specifications, has been obtained with reasonable care, and has been recorded in good faith. However, District only warrants, and Bidder may only rely, on the accuracy of limited types of information.
  - (1) As to above-ground conditions or as-built conditions shown or indicated in the Contract Documents, there is no warranty, express or implied, or any representation express or implied, that such information is correctly shown or indicated. This information is verifiable by independent investigation and Bidder is required to make such verification as a condition to bidding. In submitting its Bid, Bidder shall rely on the results of its own independent investigation. In submitting its Bid, Bidder shall not rely on District-supplied information regarding above-ground conditions or as-built conditions.
  - (2) As to any subsurface condition shown or indicated in the Contract Documents, Bidder may rely only upon the general accuracy of actual reported depths, actual reported character of materials, actual reported soil types, actual reported water conditions, or actual obstructions shown or indicated. District is not responsible for the completeness of such information for bidding or construction; nor is District responsible in any way for any conclusions or opinions that the Bidder has drawn from such information; nor is the District responsible for subsurface conditions that are not specifically shown (for example, District is not responsible for soil conditions in areas contiguous to areas where a subsurface condition is shown).
- h. Conditions Shown in Reports and Drawings Supplied for Informational Purposes: Reference is made to the document entitled Geotechnical Data, and the document entitled Existing Conditions, for identification of:
  - (1) Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by Architect in preparing the Contract Documents; and
  - (2) Physical Conditions: Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that has been utilized by Architect in preparing the Contract Documents.

- (3) These reports and drawings are **not** Contract Documents and, except for any "technical" data regarding subsurface conditions specifically identified in Geotechnical Data and Existing Conditions, and underground facilities data, Bidder may not in any manner rely on the information in these reports and drawings. Subject to the foregoing, Bidder must make its own independent investigation of all conditions affecting the Work and must not rely on information provided by District.
20. Bids shall be based on products and systems specified in Contract Documents or listed by name in Addenda. Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Bidder may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified. The District is not responsible and/or liable in any way for a Contractor's damages and/or claims related, in any way, to that Contractor's basing its bid on any requested substitution that the District has not approved in advance and in writing. Contractors and materials suppliers who submit requests for substitutions prior to the award of the Contract must do so in writing and in compliance with Public Contract Code section 3400. All requests must comply with the following:
- a. District must receive any notice of request for substitution of a specified item a minimum of **TEN (10)** calendar days prior to bid opening. The Successful Bidder will not be allowed to substitute specified items unless properly noticed.
  - b. Within 35 days after the date of the Notice of Award, the Successful Bidder shall submit data substantiating the request(s) for all substitution(s) containing sufficient information to assess acceptability of product or system and impact on Project, including, without limitation, the requirements specified in the Special Conditions and the Specifications. Insufficient information shall be grounds for rejection of substitution.
  - c. Approved substitutions, if any, shall be listed in Addenda. District reserves the right not to act upon submittals of substitutions until after bid opening.
  - d. Substitutions may be requested after Contract has been awarded only if indicated in and in accordance with requirements specified in the Special Conditions and the Specifications.
21. Bidders may examine any available "as-built" drawings of previous work by giving District reasonable advance notice. District will not be responsible for accuracy of "as-built" drawings. The document entitled Existing Conditions applies to all supplied "as-built" drawings.
22. All questions about the meaning or intent of the Contract Documents are to be directed via email to the District to [vbrum@lodiusd.net](mailto:vbrum@lodiusd.net). Interpretations or clarifications considered necessary by the District in response to such questions will be issued in writing by Addenda and emailed, faxed, mailed, or delivered to all parties recorded by the District as having received the Contract Documents or posted on the District's website at <https://www.lodiusd.net/district/departments/business-services/facilities-and-planning/fp-projects>. Questions received less than **SEVEN**

**(7)** calendar days prior to the date for opening bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

23. Addenda may also be issued to modify other parts of the Contract Documents as deemed advisable by the District.
24. Each Bidder must acknowledge each Addendum in its Bid Form and Proposal by number or its Bid shall be considered non-responsive. Each Addendum shall be part of the Contract Documents. A complete listing of Addenda may be secured from the District.
25. This Contract may include alternates. Alternates are defined as alternate products, materials, equipment, systems, methods, or major elements of the construction that may, at the District's option and under terms established in the Contract and pursuant to section 20103.8 of the Public Contract Code, be selected for the Work.
26. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on the criteria as indicated in the Notice to Bidders. In the event two or more responsible bidders submit identical bids, the District shall select the Bidder to whom to award the Contract by lot.
27. Discrepancies between written words and figures, or words and numerals, will be resolved in favor of figures or numerals.
28. Bidders in contention for contract awards shall be required to attend a Post-Bid interview, which will be set within three (3) calendar days following bid opening. A duly authorized representative of the apparent low bidder is required to attend the Post Bid Interview, in person. The apparent low bidder's authorized representative(s) must have (1) knowledge of how the bid submitted was prepared, (2) the person responsible for supervising performance of the Work, and (3) the authority to bind the apparent low bidder. Failure to attend the Post Bid Interview as scheduled will be considered just cause for the District to reject the Bid as nonresponsive.
29. Any bid protest by any Bidder regarding any other bid must be submitted in writing to the District, before 5:00 p.m. of the **THIRD (3rd)** business day following bid opening.
  - a. Only a Bidder who has actually submitted a bid, and who could be awarded the Contract if the bid protest is upheld, is eligible to submit a bid protest. Subcontractors are not eligible to submit bid protests. A Bidder may not rely on the bid protest submitted by another Bidder.
  - b. A bid protest must contain a complete statement of any and all bases for the protest and all supporting documentation. Materials submitted after the bid protest deadline will not be considered.
  - c. The protest must refer to the specific portions of all documents that form the basis for the protest.
    - (1) Without limitation to any other basis for protest, an inadvertent error in listing the California contractor's license number on the Designated



Subcontractors List shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the correct contractor's license number is submitted to the District within 24 hours after the bid opening and the corrected number corresponds with the submitted name and location for that subcontractor.

- (2) Without limitation to any other basis for protest, an inadvertent error listing an unregistered subcontractor shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive provided that any of the following apply:
    - (i) The subcontractor is registered prior to the bid opening.
    - (ii) The subcontractor is registered and has paid the penalty registration fee within 24 hours after the bid opening.
    - (iii) The subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
  - d. The protest must include the name, address and telephone number of the person representing the protesting party.
  - e. The party filing the protest must concurrently transmit a copy of the protest and any attached documentation to all other parties with a direct financial interest that may be adversely affected by the outcome of the protest. Such parties shall include all other bidders or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.
  - f. The procedure and time limits set forth in this paragraph are mandatory and are each bidder's sole and exclusive remedy in the event of bid protest. Failure to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including filing a Government Code Claim or legal proceedings.
30. The Bidder to whom Contract is awarded shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7th)** calendar day following the date of the Notice of Award. Failure to properly and timely submit these documents entitles District to reject the bid as nonresponsive.
- a. Agreement: To be executed by successful Bidder. Submit four (4) copies, each bearing an original signature.
  - b. Escrow of Bid Documentation: This must include all required documentation. See the document titled Escrow Bid Documentation for more information.
  - c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
  - d. Payment Bond (Contractor's Labor and Material Bond) (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.

- e. Insurance Certificates and Endorsements as required.
  - f. Workers' Compensation Certification.
  - g. Prevailing Wage and Related Labor Requirements Certification.
  - h. Disabled Veteran Business Enterprise Participation Certification.
  - i. Drug-Free Workplace Certification.
  - j. Tobacco-Free Environment Certification.
  - k. Hazardous Materials Certification.
  - l. Lead-Based Materials Certification.
  - m. Imported Materials Certification.
  - n. Criminal Background Investigation/Fingerprinting Certification.
  - o. Buy American Certification.
  - p. Registered Subcontractors List: Must include Department of Industrial Relations (DIR) registration number of each subcontractor for all tiers.
31. Time for Completion: District may issue a Notice to Proceed within **NINETY (90)** days from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.
- a. In the event that the District desires to postpone issuing the Notice to Proceed beyond this 90-day period, it is expressly understood that with reasonable notice to the Contractor, the District may postpone issuing the Notice to Proceed.
  - b. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed beyond a 90-day period. If the Contractor believes that a postponement of issuance of the Notice to Proceed will cause a hardship to the Contractor, the Contractor may terminate the Contract. Contractor's termination due to a postponement beyond this 90-day period shall be by written notice to District within **TEN (10)** calendar days after receipt by Contractor of District's notice of postponement.
  - c. It is further understood by the Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement and which the District had in writing authorized Contractor to perform prior to issuing a Notice to Proceed.

- d. Should the Contractor terminate the Contract as a result of a notice of postponement, District shall have the authority to award the Contract to the next lowest responsive responsible bidder.
- 32. District reserves the right to reject any or all bids, including without limitation the right to reject any or all nonconforming, nonresponsive, unbalanced, or conditional bids, to re-bid, and to reject the bid of any bidder if District believes that it would not be in the best interest of the District to make an award to that bidder, whether because the bid is not responsive or the bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by District. District also reserves the right to waive any inconsequential deviations or irregularities in any bid. For purposes of this paragraph, an "unbalanced bid" is one having nominal prices for some work items and/or enhanced prices for other work items.
- 33. It is the policy of the District that no qualified person shall be excluded from participating in, be denied the benefits of, or otherwise be subjected to discrimination in any consideration leading to the award of contract, based on race, color, gender, sexual orientation, political affiliation, age, ancestry, religion, marital status, national origin, medical condition or disability. The Successful Bidder and its subcontractors shall comply with applicable federal and state laws, including, but not limited to the California Fair Employment and Housing Act, beginning with Government Code section 12900, and Labor Code section 1735.
- 34. Prior to the award of Contract, District reserves the right to consider the responsibility of the Bidder. District may conduct investigations as District deems necessary to assist in the evaluation of any bid and to establish the responsibility, including, without limitation, qualifications and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to District's satisfaction within the prescribed time.

END OF DOCUMENT

**BIDDER INFORMATION AND FORMS**

Pursuant to Public Contract Code §20111.6, effective January 1, 2014, school districts are required to conduct a prequalification process for General Contractors, and Mechanical, Electrical and Plumbing Subcontractors for **projects over \$1,000,000**. Only those contractors who submitted a prequalification application and were notified that they qualified may submit bids on this project. Prequalification can be completed on the PQBids website using <https://pqbids.com/lodi/>. The District must receive applications at least ten (10) business days prior to the scheduled proposal submission deadline on this advertised project.

END OF DOCUMENT

**EXISTING CONDITIONS**

**1. Summary**

This document describes existing conditions at or near the Project, and use of information available regarding existing conditions. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

**2. Reports and Information on Existing Conditions**

- a. Documents providing a general description of the Site and conditions of the Work may have been collected by the Lodi Unified School District ("District"), its consultants, contractors, and tenants. These documents may, but are not required to, include previous contracts, contract specifications, tenant improvement contracts, as-built drawings, utility drawings, and information regarding underground facilities.
- b. Information regarding existing conditions may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports, documents, and other information are **not** part of the Contract Documents. These reports, documents, and other information do **not** excuse Contractor from fulfilling Contractor's obligation to independently investigate any or all existing conditions or from using reasonable prudent measures to avoid damaging existing improvements.
- c. Information regarding existing conditions may also be included in the Project Manual, but shall **not** be considered part of the Contract Documents.
- d. Prior to commencing this Work, Contractor and the District's representative shall survey the Site to document the condition of the Site. Contractor will record the survey in digital videotape format and provide an electronic copy to the District within fourteen (14) days of the survey.
- e. Contractor may also document any pre-existing conditions in writing, provided that both the Contractor and the District's representative agree on said conditions and sign a memorandum documenting the same.
- f. The reports and other data or information regarding existing conditions and underground facilities at or contiguous to the Project are the following:
  - (1) Original Construction Drawings. (If requested)
  - ~~(2) Survey of Site.~~
  - ~~(3) Geotechnical Report(s).~~
  - ~~(4) Hazardous Material Report(s).~~
  - ~~(5) Videotaped Survey(s).~~

### **3. Use of Information**

- a. Information regarding existing conditions was obtained only for use of District and its consultants, contractors, and tenants for planning and design and is **not** part of the Contract Documents.
- b. District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any information regarding existing conditions. Bidder represents and agrees that in submitting a bid it is not relying on any information regarding existing conditions supplied by District.
- c. Under no circumstances shall District be deemed to warrant or represent existing above-ground conditions, as-built conditions, or other actual conditions, verifiable by independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder must perform as a condition to bidding and Bidder should not and shall not rely on this information or any other information supplied by District regarding existing conditions.
- d. Any information shown or indicated in the reports and other data supplied herein with respect to existing underground facilities at or contiguous to the Project may be based upon information and data furnished to District by the District's employees and/or consultants or builders of such underground facilities or others. District does not assume responsibility for the completeness of this information, and Bidder is solely responsible for any interpretation or conclusion drawn from this information.
- e. District shall be responsible only for the general accuracy of information regarding underground facilities, and only for those underground facilities that are owned by District, and only where Bidder has conducted the independent investigation required of it pursuant to the Instructions to Bidders, and discrepancies are not apparent.

### **4. Investigations/Site Examinations**

- a. Before submitting a bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.
- b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract

Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

**GEOTECHNICAL DATA**

**1. Summary**

This document describes geotechnical data at or near the Project that is in the District's possession available for Contractor's review, and use of data resulting from various investigations. This document is **not** part of the Contract Documents. See General Conditions for definition(s) of terms used herein.

**2. Geotechnical Reports**

- a. Geotechnical reports may have been prepared for and around the Site and/or in connection with the Work by soil investigation engineers hired by Lodi Unified School District ("District"), and its consultants, contractors, and tenants.
- b. Geotechnical reports may be inspected at the District offices or the Construction Manager's offices, if any, and copies may be obtained at cost of reproduction and handling upon Bidder's agreement to pay for such copies. These reports are **not** part of the Contract Documents.
- c. The reports and drawings of physical conditions that may relate to the Project are the following:

**N/A**

**3. Use of Data**

- a. Geotechnical data were obtained only for use of District and its consultants, contractors, and tenants for planning and design and are **not** a part of Contract Documents.
- b. Except as expressly set forth below, District does not warrant, and makes no representation regarding, the accuracy or thoroughness of any geotechnical data. Bidder represents and agrees that in submitting a bid it is not relying on any geotechnical data supplied by District, except as specifically allowed below.
- c. Under no circumstances shall District be deemed to make a warranty or representation of existing above ground conditions, as-built conditions, geotechnical conditions, or other actual conditions verifiable by independent investigation. These conditions are verifiable by Bidder by the performance of its own independent investigation that Bidder should perform as a condition to bidding and Bidder must not and shall not rely on information supplied by District.



#### **4. Limited Reliance Permitted on Certain Information**

- a. Reference is made herein for identification of:

Reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by District in preparation of the Contract Documents.

Drawings of physical conditions in or relating to existing subsurface structures (except underground facilities) that are at or contiguous to the Site and have been utilized by District in preparation of the Contract Documents.

- b. Bidder may rely upon the general accuracy of the "technical data" contained in the reports and drawings identified above, but only insofar as it relates to subsurface conditions, provided Bidder has conducted the independent investigation required pursuant to Instructions to Bidders, and discrepancies are not apparent. The term "technical data" in the referenced reports and drawings shall be limited as follows:
- (1) The term "technical data" shall include actual reported depths, reported quantities, reported soil types, reported soil conditions, and reported material, equipment or structures that were encountered during subsurface exploration. The term "technical data" does not include, and Bidder may not rely upon, any other data, interpretations, opinions or information shown or indicated in such drawings or reports that otherwise relate to subsurface conditions or described structures.
  - (2) The term "technical data" shall not include the location of underground facilities.
  - (3) Bidder may not rely on the completeness of reports and drawings for the purposes of bidding or construction. Bidder may rely upon the general accuracy of the "technical data" contained in such reports or drawings.
  - (4) Bidder is solely responsible for any interpretation or conclusion drawn from any "technical data" or any other data, interpretations, opinions, or information provided in the identified reports and drawings.

#### **5. Investigations/Site Examinations**

- a. Before submitting a bid, each Bidder is responsible for conducting or obtaining any additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the Site or otherwise, that may affect cost, progress, performance, or furnishing of Work or that relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or that Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of Contract Documents.
- b. On request, District will provide each Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies, as each

Bidder deems necessary for submission of a bid. Bidders must fill all holes and clean up and restore the Site to its former condition upon completion of its explorations, investigations, tests, and studies. Such investigations and Site examinations may be performed during any and all Site visits indicated in the Notice to Bidders and only under the provisions of the Contract Documents, including, but not limited to, proof of insurance and obligation to indemnify against claims arising from such work, and District's prior approval.

END OF DOCUMENT

**BID FORM AND PROPOSAL**

To: Governing Board of the Lodi Unified School District ("District" or "Owner")

From: \_\_\_\_\_  
(Proper Name of Bidder)

The undersigned declares that Bidder has read and understands the Contract Documents, including, without limitation, the Notice to Bidders and the Instructions to Bidders, and agrees and proposes to furnish all necessary labor, materials, and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of Bid No. 3213-4416-2 for the following project known as:

**Parklane and Victor Elementary Schools - HVAC Replacement**

("Project" or "Contract") and will accept in full payment for that Work the following total lump sum amount, all taxes included:

_____ dollars      \$ _____
<b>BASE BID</b>

**Allowance 10%:**

_____ dollars      \$ _____
<b>Allowance 10%</b>

**TOTAL BID**

_____ dollars      \$ _____
<b>TOTAL BID</b>

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### **Additional Detail Regarding Calculation of Base Bid**

1. **Unit Prices.** The Bidder's Base Bid includes the following unit prices, which the Bidder must provide and the District may, at its discretion, utilize in valuing additive and/or deductive change orders (Unit Prices shall include all labor, materials, services, profit, overhead, insurance, bonds, taxes, and all other incidental costs of Contractor, subcontractors, and suppliers):

#### **SCHEDULE OF UNIT PRICES**

<u>Item No.</u>	<u>Description</u>	<u>Unit of Measure</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Total Cost = Unit Price x Estimated Quantity (Included in Base Bid)</u>
				\$ _____	\$ _____
				\$ _____	\$ _____

Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted, and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in accordance with intentions of the Drawings and Specifications shall be included in the above agreed-upon price amount.

2. **Allowance.** The Bidder's Base Bid and each alternate shall include a ten percent (10%) allowance for unforeseen items.

The above allowance shall only be allocated for unforeseen items relating to the Work. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared an Allowance Expenditure Directive incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive change order at or near the end of the Project for all or any portion of the allowance not allocated.

3. **OCIP. (NOT USED)**
4. The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Proposal, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to the District, and agrees that its Proposal, if accepted by the District, will be the basis for the Bidder to enter into a contract with the District in accordance with the intent of the Contract Documents.
5. The undersigned has notified the District in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract

Documents, and has contacted the Construction Manager before bid date to verify the issuance of any clarifying Addenda.

6. The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.
7. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.
8. It is understood that the District reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.
9. The following documents are attached hereto:
  - Bid Bond on the District's form or other security
  - Designated Subcontractors List
  - Site Visit Certification
  - Non-Collusion Declaration
  - Iran Contracting Act Certification (If over \$1MM)
  - ~~OCIP Insurance forms~~ (NOT USED)
10. Receipt and acceptance of the following Addenda is hereby acknowledged:

No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____
No. _____, Dated _____	No. _____, Dated _____

11. Bidder acknowledges that the license required for performance of the Work is a **Class B, General Building, C-20, Warm-Air Heating, Ventilating & Air Conditioning.**
12. Bidder hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.
13. Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with all requirements of the Department of Industrial Relations.
14. Bidder hereby certifies that its bid includes sufficient funds to permit Bidder to comply with all local, state or federal labor laws or regulations during the Project, including payment of prevailing wage, and that Bidder will comply with the provisions of Labor Code section 2810(d) if awarded the Contract
15. Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with the Davis Bacon

Act, applicable reporting requirements, and any and all other applicable requirements for federal funding. If a conflict exists, the more stringent requirement shall control.

16. Bidder represents that it is competent, knowledgeable, and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.
17. Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.
18. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Gov. Code, § 12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.
19. The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the Contract, licensed by the State of California to do the type of work required under the terms of the Contract Documents and registered as a public works contractor with the Department of Industrial Relations. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

Furthermore, Bidder hereby certifies to the District that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_

Name of Bidder: \_\_\_\_\_

Type of Organization: \_\_\_\_\_

Signed by: \_\_\_\_\_

Title of Signer: \_\_\_\_\_

Address of Bidder: \_\_\_\_\_

Taxpayer Identification No. of Bidder: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Fax Number: \_\_\_\_\_

E-mail: \_\_\_\_\_ Web Page: \_\_\_\_\_

Contractor's License No(s): No.: \_\_\_\_\_ Class: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

No.: \_\_\_\_\_ Class: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

No.: \_\_\_\_\_ Class: \_\_\_\_\_ Expiration Date: \_\_\_\_\_

Public Works Contractor Registration No.: \_\_\_\_\_

END OF DOCUMENT

**BID BOND**

**(Note: If Bidder is providing a bid bond as its bid security, Bidder must use this form, NOT a surety company form.)**

KNOW ALL PERSONS BY THESE PRESENTS:

That the undersigned, \_\_\_\_\_, as Principal ("Principal"),

and \_\_\_\_\_, as Surety ("Surety"), a corporation organized and existing under and by virtue of the laws of the State of California and authorized to do business as a surety in the State of California, are held and firmly bound unto the Lodi Unified School District ("District") of San Joaquin County, State of California, as Obligee, in an amount equal to ten percent (10%) of the Base Bid plus alternates, in the sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

lawful money of the United States of America, for the payment of which sum well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted a bid to the District for all Work specifically described in the accompanying bid for the following project: \_\_\_\_\_ ("Project" or "Contract").

NOW, THEREFORE, if the Principal is awarded the Contract and, within the time and manner required under the Contract Documents, after the prescribed forms are presented to Principal for signature, enters into a written contract, in the prescribed form in accordance with the bid, and files two bonds, one guaranteeing faithful performance and the other guaranteeing payment for labor and materials as required by law, and meets all other conditions to the Contract between the Principal and the Obligee becoming effective, or if the Principal shall fully reimburse and save harmless the Obligee from any damage sustained by the Obligee through failure of the Principal to enter into the written contract and to file the required performance and labor and material bonds, and to meet all other conditions to the Contract between the Principal and the Obligee becoming effective, then this obligation shall be null and void; otherwise, it shall be and remain in full force and effect. The full payment of the sum stated above shall be due immediately if Principal fails to execute the Contract within seven (7) days of the date of the District's Notice of Award to Principal.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or the call for bids, or to the work to be performed thereunder, or the specifications accompanying the same, shall in any way affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or the call for bids, or to the work, or to the specifications.



In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including a reasonable attorneys' fee to be fixed by the Court.

If the District awards the bid, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety above named, on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
By

\_\_\_\_\_  
Surety

\_\_\_\_\_  
By

\_\_\_\_\_  
Name of California Agent of Surety

\_\_\_\_\_  
Address of California Agent of Surety

\_\_\_\_\_  
Telephone Number of California Agent of Surety

**Bidder must attach Power of Attorney and Certificate of Authority for Surety and a Notarial Acknowledgment for all Surety's signatures. The California Department of Insurance must authorize the Surety to be an admitted Surety Insurer.**

END OF DOCUMENT

**DESIGNATED SUBCONTRACTORS LIST**  
**(Public Contact Code Sections 4100-4114)**

**PROJECT: *Parklane and Victor Elementary Schools - HVAC Replacement***

Bidder acknowledges and agrees that it must clearly set forth below the name, location and California contractor license number of each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the Work or who will specially fabricate and install a portion of the Work according to detailed drawings contained in the plans and specifications in an amount in excess of one-half of one percent (0.5%) of Bidder's total Base Bid and the kind of Work that each will perform. Vendors or suppliers of materials only do not need to be listed.

Bidder acknowledges and agrees that, if Bidder fails to list as to any portion of Work, or if Bidder lists more than one subcontractor to perform the same portion of Work, Bidder must perform that portion itself or be subjected to penalty under applicable law. In case more than one subcontractor is named for the same kind of Work, state the portion of the kind of Work that each subcontractor will perform.

If alternate bid(s) is/are called for and Bidder intends to use subcontractors different from or in addition to those subcontractors listed for work under the Base Bid, Bidder must list subcontractors that will perform Work in an amount in excess of one half of one percent (0.5%) of Bidder's total Base Bid plus alternate(s).

If further space is required for the list of proposed subcontractors, attach additional copies of page 2 showing the required information, as indicated below.

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

CA Cont. Lic. #: \_\_\_\_\_ Location: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

Date: \_\_\_\_\_

Proper Name of Bidder: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**SITE VISIT CERTIFICATION**

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID  
IF SITE VISIT WAS MANDATORY

**PROJECT: *Parklane and Victor Elementary Schools - HVAC Replacement***

Check option that applies:

\_\_\_\_\_ I certify that I visited the Site of the proposed Work, received the attached \_\_\_\_\_ pages of information, and became fully acquainted with the conditions relating to construction and labor. I fully understand the facilities, difficulties, and restrictions attending the execution of the Work under contract.

\_\_\_\_\_ I certify that \_\_\_\_\_ (Bidder's representative) visited the Site of the proposed Work, received the attached \_\_\_\_\_ pages of information, and became fully acquainted with the conditions relating to construction and labor. The Bidder's representative fully understood the facilities, difficulties, and restrictions attending the execution of the Work under contract.

Bidder fully indemnifies the Lodi Unified School District, its Architect, its Engineers, its Construction Manager, and all of their respective officers, agents, employees, and consultants from any damage, or omissions, related to conditions that could have been identified during my visit and/or the Bidder's representative's visit to the Site.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: \_\_\_\_\_

Proper Name of Bidder: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

**ATTACHMENTS:**

**1.**

**2.**

**3.**

END OF DOCUMENT

**NON-COLLUSION DECLARATION  
(Public Contract Code Section 7106)**

The undersigned declares:

I am the \_\_\_\_\_ of \_\_\_\_\_, the party making the foregoing bid.  
[Title] [Name of Firm]

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on \_\_\_\_\_,  
[Date]

at \_\_\_\_\_, \_\_\_\_\_.  
[City] [State]

Date: \_\_\_\_\_

Proper Name of Bidder: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**IRAN CONTRACTING ACT CERTIFICATION**  
**(Public Contract Code Sections 2202-2208)**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder")  
("Contract" or "Project").

Prior to bidding on or submitting a proposal for a contract for goods or services of **\$1,000,000 or more**, the bidder/proposer must submit this certification pursuant to Public Contract Code section 2204.

The bidder/proposer must complete **ONLY ONE** of the following two options. To complete OPTION 1, check the corresponding box **and** complete the certification below. To complete OPTION 2, check the corresponding box, complete the certification below, and attach documentation demonstrating the exemption approval.

- ☐ **OPTION 1.** Bidder/Proposer is not on the current list of persons engaged in investment activities in Iran created by the California Department of General Services ("DGS") pursuant to Public Contract Code section 2203(b), and we are not a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person, for 45 days or more, if that other person will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS.
- ☐ **OPTION 2.** Bidder/Proposer has received a written exemption from the certification requirement pursuant to Public Contract Code sections 2203(c) and (d). *A copy of the written documentation demonstrating the exemption approval is included with our bid/proposal.*

**CERTIFICATION:**

I, the official named below, CERTIFY UNDER PENALTY OF PERJURY, that I am duly authorized to legally bind the bidder/proposer to the OPTION selected above. This certification is made under the laws of the State of California.

<i>Vendor Name/Financial Institution (Printed)</i>	<i>Federal ID Number (or n/a)</i>
<i>By (Authorized Signature)</i>	
<i>Printed Name and Title of Person Signing</i>	<i>Date Executed</i>

END OF DOCUMENT

**WORKERS' COMPENSATION CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder") ("Contract" or "Project").

Labor Code section 3700, in relevant part, provides:

Every employer except the State shall secure the payment of compensation in one or more of the following ways:

- a. By being insured against liability to pay compensation by one or more insurers duly authorized to write compensation insurance in this state; and/or
- b. By securing from the Director of Industrial Relations a certificate of consent to self-insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his employees.

I am aware of the provisions of section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

(In accordance with Labor Code sections 1860 and 1861, the above certificate must be signed and filed with the awarding body prior to performing any Work under this Contract.)

END OF DOCUMENT



**PREVAILING WAGE AND  
RELATED LABOR REQUIREMENTS CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder")  
("Contract" or "Project").

I hereby certify that I will conform to the State of California Public Works Contract requirements regarding prevailing wages, benefits, on-site audits with 48-hours' notice, payroll records, and apprentice and trainee employment requirements, for all Work on the above Project including, without limitation, labor compliance monitoring and enforcement by the Department of Industrial Relations.

**[IF THIS PROJECT USES FEDERAL FUNDS, DISTRICT SHOULD INCLUDE THE FOLLOWING]** I hereby certify that I will also conform to the Federal Labor Standards Provisions regarding minimum wages, withholding, payrolls and basic records, apprentice and trainee employment requirements, equal employment opportunity requirements, Copeland Act requirements, Davis-Bacon and Related Act requirements, Contract Work Hours and Safety Standards Act requirements, and any and all other applicable requirements for federal funding for all Work on the above Project.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**DISABLED VETERAN BUSINESS  
ENTERPRISE PARTICIPATION CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder")  
("Contract" or "Project").

**GENERAL INSTRUCTIONS**

Section 17076.11 of the Education Code requires school districts using, or planning to use, funds allocated pursuant to the State of California School Facility Program ("Program") for the construction and/or modernization of school buildings to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%) per year of the overall dollar amount expended each year by the school district on projects that receive state funding. Therefore, the lowest responsive responsible Bidder awarded the Contract must submit this document to the District with its executed Agreement, identifying the steps contractor took to solicit DVBE participation in conjunction with this Contract. **Do not submit this form with your bids.**

**PART I – Method of Compliance with DVBE Participation Goals.** Check the appropriate box to indicate your method of committing the contract dollar amount.

<b>YOUR BUSINESS ENTERPRISE IS:</b>	<b>AND YOU WILL</b>	<b>AND YOU WILL</b>
<b>A.</b> <input type="checkbox"/> Disabled veteran owned and your forces will perform at least 3% of this Contract	Include a copy of your DVBE letter from Office of Small Business and Disabled Veterans Business Enterprise Services ("OSDS")*	Complete Part 1 of this form and the Certification
<b>B.</b> <input type="checkbox"/> Disabled veteran owned but is unable to perform 3% of this Contract with your forces	Use DVBE subcontractors /suppliers to bring the Contract participation to at least 3%	Include a copy of each DVBE's letter from OSDS (including yours, if applicable), and complete Part 1 of this form and the Certification
<b>C.</b> <input type="checkbox"/> <b>NOT</b> disabled veteran owned	Use DVBE subcontractors /suppliers for at least 3% of this Contract	
<b>D.</b> <input type="checkbox"/> Unable to meet the required participation goals	Complete all of this form and the Certification	

\* A DVBE letter from OSDS is obtained from the participating DVBE.

**You must complete the following table to show the dollar amount of DVBE participation:**

	<b>TOTAL CONTRACT PRICE</b>
<b>A.</b> Prime Bidder, if DVBE (own participation)	\$
<b>B.</b> DVBE Subcontractor or Supplier	
<b>1.</b>	
<b>2.</b>	
<b>3.</b>	
<b>4.</b>	
<b>C.</b> Subtotal (A & B)	
<b>D.</b> Non-DVBE	
<b>E.</b> Total Bid	

**PART II – Contacts.** To identify DVBE subcontractors/suppliers for participation in your contract, you must contact each of the following categories. You should contact several DVBE organizations.

<b>CATEGORY</b>	<b>TELEPHONE NUMBER</b>	<b>DATE CONTACTED</b>	<b>PERSON CONTACTED</b>
<b>1.</b> The District, if any			*
<b>2.</b> OSDS, provides assistance locating DVBEs at <a href="https://caleprocure.ca.gov/pages/PublicSearch/supplier-search.aspx">https://caleprocure.ca.gov/pages/PublicSearch/supplier-search.aspx</a>	(916) 375-4940		*
<b>3.</b> DVBE Organization (List)			*

\*Write "recorded message" in this column, if applicable.

**PART III – Advertisement.** You must advertise for DVBE participation in both a trade and focus paper. List the advertisement you place to solicit DVBE participation. Advertisements should be published at least fourteen (14) days prior to bid/proposal opening; if you cannot advertise fourteen (14) days prior, advertisements should be published as soon as possible. Advertisements must include that your firm is seeking DVBE participation, the project name and location, and your firm’s name, your contact person, and telephone number. Attach copies of advertisements to this form.

FOCUS/TRADE PAPER NAME	CHECK ONE		DATE OF ADVERTISEMENT
	TRADE	FOCUS	

**PART IV – DVBE Solicitations.** List DVBE subcontractors/suppliers that were invited to bid. Use the following instructions to complete the remainder of this section (read the three columns as a sentence from left to right). If you need additional space to list DVBE solicitations, please use a separate page and attach to this form.

IF THE DVBE.....	THEN.....		AND.....	
was selected to participate	Check "YES" in the "SELECTED" column		include a copy of their DVBE letter(s) from OSDS	
was <b>NOT</b> selected to participate	Check "NO" in the "SELECTED" column		state why in the "REASON NOT SELECTED" column	
did not respond to your solicitation	Check the "NO RESPONSE" column.			
DVBE CONTACTED	SELECTED		REASON NOT SELECTED	NO RESPONSE
	YES	NO		

A copy of this form must be retained by you and may be subject to a future audit.

**CERTIFICATION**

I, \_\_\_\_\_, certify that I am the bidder's \_\_\_\_\_  
and that I have made a diligent effort to ascertain the facts with regard to the  
representations made herein. In making this certification, I am aware of section 12650 et  
seq. of the Government Code providing for the imposition of treble damages for making  
false claims.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**DRUG-FREE WORKPLACE CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder") ("Contract" or "Project").

This Drug-Free Workplace Certification form is required from the successful Bidder pursuant to Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990. The Drug-Free Workplace Act of 1990 requires that every person or organization awarded a contract or grant for the procurement of any property or service from any state agency must certify that it will provide a drug-free workplace by doing certain specified acts. In addition, the Act provides that each contract or grant awarded by a state agency may be subject to suspension of payments or termination of the contract or grant, and the contractor or grantee may be subject to debarment from future contracting, if the contracting agency determines that specified acts have occurred.

The District is not a "state agency" as defined in the applicable section(s) of the Government Code, but the District is a local agency and public school district under California law and requires all contractors on District projects to comply with the provisions and requirements of the Drug-Free Workplace Act of 1990.

Contractor must also comply with the provisions of Health & Safety Code section 11362.3 which prohibits the consumption or possession of cannabis or cannabis products in any public place, including school grounds, and specifically on school grounds while children are present.

Contractor shall certify that it will provide a drug-free workplace by doing all of the following:

- a. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's or organization's workplace and specifying actions which will be taken against employees for violations of the prohibition.
- b. Establishing a drug-free awareness program to inform employees about all of the following:
  - (1) The dangers of drug abuse in the workplace.
  - (2) The person's or organization's policy of maintaining a drug-free workplace.
  - (3) The availability of drug counseling, rehabilitation, and employee-assistance programs.
  - (4) The penalties that may be imposed upon employees for drug abuse violations.

- c. Requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required above, and that, as a condition of employment on the contract or grant, the employee agrees to abide by the terms of the statement.

I, the undersigned, agree to fulfill the terms and requirements of Government Code section 8355 listed above and will publish a statement notifying employees concerning (a) the prohibition of controlled substance at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the Contract be given a copy of the statement required by section 8355(a), and requiring that the employee agree to abide by the terms of that statement.

I also understand that if the District determines that I have either (a) made a false certification herein, or (b) violated this certification by failing to carry out the requirements of section 8355, that the Contract awarded herein is subject to termination, suspension of payments, or both. I further understand that, should I violate the terms of the Drug-Free Workplace Act of 1990, I may be subject to debarment in accordance with the requirements of the aforementioned Act.

I acknowledge that I am aware of the provisions of and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990 and Health and Safety Code section 11362.3.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**TOBACCO-FREE ENVIRONMENT CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder")  
("Contract" or "Project").

This Tobacco-Free Environment Certification form is required from the successful Bidder.

Pursuant to, without limitation, 20 U.S.C. section 6083, Labor Code section 6400 et seq., Health & Safety Code section 104350 et seq., Business and Professions Code section 22950 et seq., and District Board policies, all District sites, including the Project site, are tobacco-free environments. Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school-owned vehicles and vehicles owned by others while on District property. The prohibition on smoking includes the use of any electronic smoking device that creates an aerosol or vapor, in any manner or in any form, and the use of any oral smoking device for the purpose of circumventing the prohibition of tobacco smoking. Further, Health & Safety Code section 11362.3 prohibits the smoking or use of cannabis or cannabis products in any place where smoking tobacco is prohibited.

I acknowledge that I am aware of the District's policy regarding tobacco-free environments at District sites, including the Project site and hereby certify that I will adhere to the requirements of that policy and not permit any of my firm's employees, agents, subcontractors, or my firm's subcontractors' employees or agents, to use tobacco and/or smoke on the Project site.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT



**HAZARDOUS MATERIALS CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder") ("Contract" or "Project").

1. Contractor hereby certifies that no asbestos, or asbestos-containing materials, polychlorinated biphenyl (PCB), or any material listed by the federal or state Environmental Protection Agency or federal or state health agencies as a hazardous material, or any other material defined as being hazardous under federal or state laws, rules, or regulations, ("New Hazardous Material"), shall be furnished, installed, or incorporated in any way into the Project or in any tools, devices, clothing, or equipment used to affect any portion of Contractor's work on the Project for District.
2. Contractor further certifies that it has instructed its employees with respect to the above-mentioned standards, hazards, risks, and liabilities.
3. Asbestos and/or asbestos-containing material shall be defined as all items containing but not limited to chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite. Any or all material containing greater than one-tenth of one percent (0.1%) asbestos shall be defined as asbestos-containing material.
4. Any disputes involving the question of whether or not material is New Hazardous Material shall be settled by electron microscopy or other appropriate and recognized testing procedure, at the District's determination. The costs of any such tests shall be paid by Contractor if the material is found to be New Hazardous Material.
5. All Work or materials found to be New Hazardous Material or Work or material installed with equipment containing New Hazardous Material will be immediately rejected and this Work will be removed at Contractor's expense at no additional cost to the District.
6. Contractor has read and understood the document titled Hazardous Materials Procedures & Requirements, and shall comply with all the provisions outlined therein.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**LEAD-BASED MATERIALS CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder") ("Contract" or "Project").

This certification provides notice to the Contractor that:

- (1) Contractor's work may disturb lead-containing building materials.
- (2) Contractor shall notify the District if any work may result in the disturbance of lead-containing building materials.
- (3) Contractor shall comply with the Renovation, Repair and Painting Rule, if lead-based paint is disturbed in a six-square-foot or greater area indoors or a 20-square-foot or greater area outdoors.

**1. Lead as a Health Hazard**

Lead poisoning is recognized as a serious environmental health hazard facing children today. Even at low levels of exposure, much lower than previously believed, lead can impair the development of a child's central nervous system, causing learning disabilities, and leading to serious behavioral problems. Lead enters the environment as tiny lead particles and lead dust disburse when paint chips, chalks, peels, wears away over time, or is otherwise disturbed. Ingestion of lead dust is the most common pathway of childhood poisoning; lead dust gets on a child's hands and toys and then into a child's mouth through common hand-to-mouth activity. Exposures may result from construction or remodeling activities that disturb lead paint, from ordinary wear and tear of windows and doors, or from friction on other surfaces.

Ordinary construction and renovation or repainting activities carried out without lead-safe work practices can disturb lead-based paint and create significant hazards. Improper removal practices, such as dry scraping, sanding, or water blasting painted surfaces, are likely to generate high volumes of lead dust.

Because the Contractor and its employees will be providing services for the District, and because the Contractor's work may disturb lead-containing building materials, CONTRACTOR IS HEREBY NOTIFIED of the potential presence of lead-containing materials located within certain buildings utilized by the District. All school buildings built prior to 1978 are presumed to contain some lead-based paint until sampling proves otherwise.

**2. Overview of California Law**

Education Code section 32240 et seq. is known as the Lead-Safe Schools Protection Act. Under this act, the Department of Health Services is to conduct a sample survey of schools in the State of California for the purpose of developing risk factors to predict lead contamination in public schools. (Ed. Code, § 32241.)

Any school that undertakes any action to abate existing risk factors for lead is required to utilize trained and state-certified contractors, inspectors, and workers. (Ed. Code, § 32243, subd. (b).) Moreover, lead-based paint, lead plumbing, and solders, or other potential sources of lead contamination, shall not be utilized in the construction of any new school facility or the modernization or renovation of any existing school facility. (Ed. Code, § 32244.)

Both the Federal Occupational Safety and Health Administration ("Fed/OSHA") and the California Division of Occupational Safety and Health ("Cal/OSHA") have implemented safety orders applicable to all construction work where a contractor's employee may be occupationally exposed to lead.

The OSHA Regulations apply to all construction work where a contractor's employee may be occupationally exposed to lead. The OSHA Regulations contain specific and detailed requirements imposed on contractors subject to those regulations. The OSHA Regulations define construction work as work for construction, alteration, and/or repair, including painting and decorating. Regulated work includes, but is not limited to, the following:

- a. Demolition or salvage of structures where lead or materials containing lead are present;
- b. Removal or encapsulation of materials containing lead;
- c. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- d. Installation of products containing lead;
- e. Lead contamination/emergency cleanup;
- f. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- g. Maintenance operations associated with the construction activities described in the subsection.

Because it is assumed by the District that all painted surfaces (interior as well as exterior) within the District contain some level of lead, it is imperative that the Contractor, its workers and subcontractors fully and adequately comply with all applicable laws, rules and regulations governing lead-based materials (including title 8, California Code of Regulations, section 1532.1).

**Contractor shall notify the District if any Work may result in the disturbance of lead-containing building materials. Any and all Work that may result in the disturbance of lead-containing building materials shall be coordinated through the District. A signed copy of this Certification shall be on file prior to beginning Work on the Project, along with all current insurance certificates.**

**3. Renovation, Repair and Painting Rule, Section 402(c)(3) of the Toxic Substances Control Act**

The EPA requires lead safe work practices to reduce exposure to lead hazards created by renovation, repair and painting activities that disturb lead-based paint. Pursuant to the Renovation, Repair and Painting Rule (RRP), renovations in homes, childcare facilities, and schools built prior to 1978 must be conducted by certified renovations firms, using renovators with training by a EPA-accredited training provider, and fully and adequately complying with all applicable laws, rules and regulations governing lead-based materials, including those rules and regulations appearing within title 40 of the Code of Federal Regulations as part 745 (40 CFR 745).

The RRP requirements apply to all contractors who disturb lead-based paint in a six-square-foot or greater area indoors or a 20-square-foot or greater area outdoors. If a DPH-certified inspector or risk assessor determines that a home constructed before 1978 is lead-free, the federal certification is not required for anyone working on that particular building.

**4. Contractor's Liability**

If the Contractor fails to comply with any applicable laws, rules, or regulations, and that failure results in a site or worker contamination, the Contractor will be held solely responsible for all costs involved in any required corrective actions, and shall defend, indemnify, and hold harmless the District, pursuant to the indemnification provisions of the Contract, for all damages and other claims arising therefrom.

If lead disturbance is anticipated in the Work, only persons with appropriate accreditation, registrations, licenses, and training shall conduct this Work.

It shall be the responsibility of the Contractor to properly dispose of any and all waste products, including, but not limited to, paint chips, any collected residue, or any other visual material that may occur from the prepping of any painted surface. It will be the responsibility of the Contractor to provide the proper disposal of any hazardous waste by a certified hazardous waste hauler. This company shall be registered with the Department of Transportation (DOT) and shall be able to issue a current manifest number upon transporting any hazardous material from any school site within the District.

The Contractor shall provide the District with any sample results prior to beginning Work, during the Work, and after the completion of the Work. The District may request to examine, prior to the commencement of the Work, the lead training records of each employee of the Contractor.

THE CONTRACTOR HEREBY ACKNOWLEDGES, UNDER PENALTY OF PERJURY, THAT IT:

1. HAS RECEIVED NOTIFICATION OF POTENTIAL LEAD-BASED MATERIALS ON THE OWNER'S PROPERTY;
2. IS KNOWLEDGEABLE REGARDING AND WILL COMPLY WITH ALL APPLICABLE LAWS, RULES, AND REGULATIONS GOVERNING WORK WITH, AND DISPOSAL, OF LEAD.

THE UNDERSIGNED WARRANTS THAT HE/SHE HAS THE AUTHORITY TO SIGN ON BEHALF OF AND BIND THE CONTRACTOR. THE DISTRICT MAY REQUIRE PROOF OF SUCH AUTHORITY.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**IMPORTED MATERIALS CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder") ("Contract" or "Project").

This form shall be executed by all entities that, in any way, provide or deliver and/or supply any soils, aggregate, or related materials ("Fill") to the Project Site and shall be provided to the District at least ten (10) days before delivery. All Fill shall satisfy all requirements of any environmental review of the Project performed pursuant to the statutes and guidelines of the California Environmental Quality Act, section 21000 et seq. of the Public Resources Code ("CEQA"), and all requirements of section 17210 et seq. of the Education Code, including requirements for a Phase I environmental assessment acceptable to the State of California Department of Education and Department of Toxic Substances Control.

Certification of: ☐ Delivery Firm/Transporter ☐ Supplier ☐ Manufacturer  
☐ Wholesaler ☐ Broker ☐ Retailer  
☐ Distributor ☐ Other \_\_\_\_\_

Type of Entity ☐ Corporation ☐ General Partnership  
☐ Limited Partnership ☐ Limited Liability Company  
☐ Sole Proprietorship ☐ Other \_\_\_\_\_

Name of firm ("Firm"): \_\_\_\_\_

Mailing address: \_\_\_\_\_

Addresses of branch office used for this Project: \_\_\_\_\_

If subsidiary, name and address of parent company: \_\_\_\_\_

By my signature below, I hereby certify that I am aware of section 25260 of the Health and Safety Code and the sections referenced therein regarding the definition of hazardous material. I further certify on behalf of the Firm that all soils, aggregates, or related materials provided, delivered, and/or supplied or that will be provided, delivered, and/or supplied by this Firm to the Project Site are free of any and all hazardous material as defined in section 25260 of the Health and Safety Code. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: \_\_\_\_\_

Proper Name of Firm: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**CRIMINAL BACKGROUND INVESTIGATION**  
**/FINGERPRINTING CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder")  
("Contract" or "Project").

The undersigned does hereby certify to the governing board of the District as follows:

That I am a representative of the Contractor currently under contract with the District; that I am familiar with the facts herein certified; and that I am authorized and qualified to execute this certificate on behalf of Contractor.

Contractor certifies that it has taken at least one of the following actions with respect to the construction Project that is the subject of the Contract (check all that apply):

- ☐ The Contractor is a sole proprietor and intends to comply with the fingerprinting requirements of Education Code section 45125.1(k) with respect to all Contractor's employees who may have contact with District pupils in the course of providing services pursuant to the Contract, and hereby agrees to the District's preparation and submission of fingerprints such that the California Department of Justice may determine that none of those employees has been convicted of a felony, as that term is defined in Education Code section 45122.1. No work shall commence until such determination by DOJ has been made.

As an authorized District official, I am familiar with the facts herein certified, and am authorized to execute this certificate on behalf of the District and undertake to prepare and submit Contractor's fingerprints as if he or she was an employee of the District.

Date: \_\_\_\_\_

District Representative's Name and Title: \_\_\_\_\_

District Representative's Signature: \_\_\_\_\_

- ☐ The Contractor, who is not a sole proprietor, has complied with the fingerprinting requirements of Education Code section 45125.1 with respect to all Contractor's employees and all of its Subcontractors' employees who may have contact with District pupils in the course of providing services pursuant to the Contract, and the California Department of Justice has determined that none of those employees has been convicted of a felony, as that term is defined in Education Code section 45122.1. A complete and accurate list of Contractor's employees and of all of its subcontractors' employees who may come in contact with District pupils during the course and scope of the Contract is attached hereto; and/or
- ☐ Pursuant to Education Code section 45125.2, Contractor has installed or will install, prior to commencement of Work, a physical barrier at the Work Site, that will limit contact between Contractor's employees and District pupils at all times; and/or

- ☐ Pursuant to Education Code section 45125.2, Contractor certifies that all employees will be under the continual supervision of, and monitored by, an employee of the Contractor who the California Department of Justice has ascertained, or as described below, will ascertain, has not been convicted of a violent or serious felony. The name and title of the employee who will be supervising Contractor's and its subcontractors' employees is:

Name: \_\_\_\_\_

Title: \_\_\_\_\_

**NOTE:** If the Contractor is a sole proprietor, and elects the above option, Contractor must have the above-named employee's fingerprints prepared and submitted by the District, in accordance with Education Code section 45125.1(k). No work shall commence until such determination by DOJ has been made.

As an authorized District official, I am familiar with the facts herein certified, and am authorized to execute this certificate on behalf of the District and undertake to prepare and submit Contractor's fingerprints as if he or she was an employee of the District.

Date: \_\_\_\_\_

District Representative's Name and Title: \_\_\_\_\_

District Representative's Signature: \_\_\_\_\_

- ☐ *The Work on the Contract is either (i) at an unoccupied school site and no employee and/or subcontractor or supplier of any tier of the Contract shall come in contact with the District pupils or (ii) Contractor's employees or any subcontractor or supplier of any tier of the Contract will have only limited contact, if any, with District pupils and the District will take appropriate steps to protect the safety of any pupils that may come in contact with Consultant's employees, subcontractors or suppliers so that the fingerprinting and criminal background investigation requirements of Education Code section 45125.1 shall not apply to Contractor under the Contract.*

*As an authorized District official, I am familiar with the facts herein certified, and am authorized to execute this certificate on behalf of the District.*

Date: \_\_\_\_\_

District Representative's Name and Title: \_\_\_\_\_

District Representative's Signature: \_\_\_\_\_

Contractor's responsibility for background clearance extends to all of its employees, Subcontractors, and employees of Subcontractors coming into contact with District pupils regardless of whether they are designated as employees or acting as independent contractors of the Contractor.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_



**BUY AMERICAN CERTIFICATION**

PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor" or "Bidder") ("Contract" or "Project").

Federal regulations require that all of the iron, steel, and manufactured goods used in projects for the construction, installation, repairs, renovation, modernization, or maintenance of a public building or public work funded in part or in whole by federal stimulus funds, with the exception of projects funded by Qualified School Construction Bonds, be produced in the United States of America, unless a federal department waives this requirement because (1) it is inconsistent with the public interest, (2) the goods are not produced in sufficient quantities or of satisfactory quality in the United States, or (3) the requirement would increase the cost of the Project overall by more than twenty-five percent (25%) ("Buy American").

Contractor shall submit this Certification with its executed agreement, identifying the steps Contractor will take to use goods produced in the United States of America in carrying out this Contract. Bidder should not submit this form with its bid.

Contractor shall retain a copy of this form and may be subject to a future audit.

**CERTIFICATION**

On behalf of Contractor, I represent and covenant that Contractor will use on the Project only iron, steel and manufactured goods produced in the United States of America except goods for which a federal department has waived this requirement.

I, \_\_\_\_\_, certify that I am the Contractor's \_\_\_\_\_ and that the representations and covenants made herein are true and correct. In making this certification, I am aware of section 12650 et seq. of the Government Code providing for the imposition of treble damages for making false claims.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT



By my signature below, I hereby certify that, to the best of my knowledge, the contents of this disclosure are true, or are believed to be true. I further certify on behalf of the Firm that I am aware of section 3000 et seq. of the California Public Contract Code, and the sections referenced therein regarding the penalties for providing false information or failing to disclose a financial relationship in this disclosure. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: \_\_\_\_\_

Proper Name of Firm: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**REGISTERED SUBCONTRACTORS LIST**  
**(Labor Code Section 1771.1)**

PROJECT: **Parklane and Victor Elementary Schools - HVAC Replacement**  
**#3213-4416-2**

Date Submitted (for Updates): \_\_\_\_\_

Contractor acknowledges and agrees that it must clearly set forth below the name and Department of Industrial Relations (DIR) registration number of each subcontractor **for all tiers** who will perform work or labor or render service to Contractor or its subcontractors in or about the construction of the Work **at least two (2) weeks before the subcontractor is scheduled to perform work**. This document is to be updated as all tiers of subcontractors are identified.

Contractor acknowledges and agrees that, if Contractor fails to list as to any subcontractor of any tier who performs any portion of Work, the Contract is subject to cancellation and the Contractor will be subjected to penalty under applicable law.

If further space is required for the list of proposed subcontractors, attach additional copies of page 2 showing the required information, as indicated below.

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

**Subcontractor Name:** \_\_\_\_\_

DIR Registration #: \_\_\_\_\_

Portion of Work: \_\_\_\_\_

Date: \_\_\_\_\_

Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**POST BID INTERVIEW**

**PART 1 – GENERAL**

**1.01 SUMMARY**

If requested by the District, this Section requires the apparent low bidder to attend and participate in a Post Bid Interview with the Construction Manager, prior to award of any contract by the District. The Post Bid Interview will be scheduled by the Construction Manager within three (3) calendar days after the date of bid.

**1.02 REQUIRED ATTENDANCE**

- A. A duly authorized representative of the apparent low bidder is required to attend the Post Bid Interview, in person.
- B. The apparent low bidder's authorized representative(s) must have (1) knowledge of how the bid submitted was prepared, (2) the person responsible for supervising performance of the Work, and (3) the authority to bind the apparent low bidder.
- C. Failure to attend the Post Bid Interview as scheduled will be considered just cause for the District to reject the Bid as nonresponsive.

**1.03 POST BID INTERVIEW PROCEDURE**

- A. The Construction Manager will review the Bid with the attendees.
- B. The Construction Manager will review the Contract Documents with the attendees, including but not limited to:
  - (1) Insurance
  - (2) Bonding
  - (3) Addenda
  - (4) Pre-Bid Clarifications
  - (5) Scope of Work
  - (6) Bid Packages Descriptions
  - (7) Bid Alternates
  - (8) Contract Plans
  - (9) Contract Specifications
  - (10) Project Schedule and Schedule Requirements

- (11) Critical Dates Requirement for Other Bid Packages
- (12) Prevailing Wage Requirements
- (13) Liquidated Damages
- (14) Required Documentation for Contract Administration
- (15) Contract Coordination Requirements

#### **1.04 POST BID INTERVIEW DOCUMENTATION**

The Construction Manager will document the Post Bid Interview on the form attached to this Section. Both the apparent low bidder and the Construction Manager are required to sign the Post Bid Interview Documentation.

*[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]*

## **POST BID INTERVIEW**

### **CONSTRUCTION MANAGER**

[Name]

[Address 1]

[Address 2]

[Phone]

[Fax]

BIDDER: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ PHONE: \_\_\_\_\_

#### **I. INTRODUCTIONS:**

##### **A. Present**

\_\_\_\_\_  
CONTRACTOR

\_\_\_\_\_  
CONTRACTOR

\_\_\_\_\_  
[CM]

\_\_\_\_\_  
[CM]

#### **II. PROPOSED CONTRACT:**

#### **III. PURPOSE OF INTERVIEW IS TO ASSURE A MUTUAL UNDERSTANDING OF THE FOLLOWING:**

- |  |     |    |
|--|-----|----|
| A. Do you acknowledge submission of a complete and accurate bid?   | Yes | No |
| B. Do you acknowledge the Bid Document submittal timelines after NOA and NTP and can you meet those timelines? | Yes | No |
| C. Do you acknowledge the requirements for the escrow of bid documents?  | Yes | No |
| D. Are you comfortable with your listed subcontractors?  | Yes | No |

#### **IV. CONTRACTUAL REQUIREMENTS:**

- |  |     |    |
|--|-----|----|
| A. Do you understand you are a prime contractor?   | Yes | No |
| B. Can you meet specified insurance requirements?  | Yes | No |
| 1. Do any of your policies that require Additional Insured endorsements exceed the minimum coverage requirements?  | Yes | No |
| 2. Are you requesting that the District accept an Excess Liability Insurance Policy to meet the policy limit?  | Yes | No |
| 3. Will there be a gap between the per occurrence amount of any underlying policy and the start of the coverage under the Umbrella or Excess Liability Insurance Policy? | Yes | No |



C.	Will you provide the Performance Bond and Labor and Material Bond for 100% of the Contract Price as stipulated?	Yes	No
1.	Cost for bonds: _____%	Yes	No
2.	Is the cost of your bonds in your base bid?	Yes	No
3.	Is your surety licensed to issue bonds in California?	Yes	No
D.	Do you understand the fingerprinting requirements?	Yes	No
E.	Is it understood that all workers must be paid prevailing wage?	Yes	No
F.	Is it understood that all subcontractors of every tier must be registered as a public works contractor with the Department of Industrial Relations?	Yes	No
V. SCOPE OF WORK:			
A.	Acknowledged Receipt of Addenda #1-____	Yes	No
B.	Are the costs for addenda items included in your bid? (if applicable)	Yes	No
C.	Do you have a complete understanding of your Scope of Work under the proposed Agreement?	Yes	No
D.	You have re-reviewed the documents and understand the Scope of the Work. Are there any items that require clarification?	Yes	No
If yes, please identify them.			
1.	_____		
	_____		
2.	_____		
	_____		
3.	_____		
	_____		
	Is (are) there additional cost(s) for the above item(s)?	Yes	No
E.	Is the cost for allowance included in your bid?	Yes	No
F.	Have you reviewed bid alternative(s) #1-____? (if applicable)	Yes	No
G.	Are the costs for bid alternatives included in your bid?	Yes	No
H.	Are the plans and specifications clear and understandable to your satisfaction?	Yes	No

- I. Do you acknowledge that the time to submit notice of requests for substitution of specified materials has expired? Yes No
- VI. SCHEDULE:
- A. Do you acknowledge and agree to the stipulated completion dates and milestones in the contract? Yes No
1. Will you provide a detailed construction schedule to \_\_\_\_\_ within the required ten (10) days of the Notice to Proceed, per the contract? Yes No
2. Can you meet the submittal deadline? Yes No
3. It is understood that the Project schedule is critical and that that weekend and overtime work may be required to meet the milestones. Yes No
4. It is understood that if rain does occur, then all dewatering and protection of work is required, per the contract. Yes No  
If not, what do you believe must change and why? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- B. Identify critical materials, deliveries, long lead items and other dependencies, including Owner Furnished items that could affect the completion of your work. Yes No
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
- C. Do you understand that there is going to be maintenance and other construction taking place on site during the course of the project? Yes No
- VII. EXECUTION OF WORK
- A. Do you understand the access to the site? Yes No
- B. Do you understand the staging area restrictions? Yes No
- C. Have you included protection of [asphalt, floors, and roofs]? Yes No

D. Do you understand that the site is occupied by students, teachers, administrators, parents, etc.? Yes No

VIII. CONTRACTOR COMMENTS/SUGGESTIONS:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

IX. CONTRACTOR

**You agree the information contained herein is part of your contractual obligations. Your signature acknowledges your agreement to perform all Work in the Contract Documents, and that costs for all Work are included in your bid.**

The foregoing information is true and accurate, and I am authorized to sign as an officer of the company I am representing.

[Company Name]

\_\_\_\_\_  
Signature \_\_\_\_\_ Title: \_\_\_\_\_

Date: \_\_\_\_\_

X. CONSTRUCTION MANAGER

\_\_\_\_\_  
Signature \_\_\_\_\_ Title: \_\_\_\_\_

Date: \_\_\_\_\_

Title of Document: POST BID INTERVIEW

Number of Pages: \_\_\_\_\_

Date of Document: \_\_\_\_\_

END OF DOCUMENT

**NOTICE OF AWARD**

Dated: \_\_\_\_\_ 20\_\_

To: \_\_\_\_\_ (Contractor)

To: \_\_\_\_\_  
(Address)

From: Governing Board ("Board") of the Lodi Unified School District ("District")

**Re: Parklane and Victor Elementary Schools - HVAC Replacement, Project No. #3213-4416-2** ("Project").

Contractor has been awarded the Contract for the above-referenced Project on \_\_\_\_\_, 20\_\_, by action of the District's Board.

The Contract Price is \_\_\_\_\_ Dollars (\$\_\_\_\_\_) and includes alternates \_\_\_\_\_.

Three (3) copies of each of the Contract Documents (except Drawings) accompany this Notice of Award. Three (3) sets of the Drawings will be delivered separately or otherwise made available. Additional copies are available at cost of reproduction.

You must comply with the following conditions precedent within **SEVEN (7)** calendar days of the date of this Notice of Award.

The Contractor shall execute and submit the following documents by 5:00 p.m. of the **SEVENTH (7th)** calendar day following the date of the Notice of Award.

- a. Agreement: To be executed by successful Bidder. Submit three (3) copies, each bearing an original signature.
- b. Escrow of Bid Documentation: This must include all required documentation. See the document titled Escrow Bid Documentation for more information.
- c. Performance Bond (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
- d. Payment Bond (Contractor's Labor & Material Bond) (100%): On the form provided in the Contract Documents and fully executed as indicated on the form.
- e. Insurance Certificates and Endorsements as required.
- f. Workers' Compensation Certification.
- g. Prevailing Wage and Related Labor Requirements Certification.
- h. Disabled Veteran Business Enterprise Participation Certification.

- i. Drug-Free Workplace Certification.
- j. Tobacco-Free Environment Certification.
- k. Hazardous Materials Certification.
- l. Lead-Based Materials Certification.
- m. Imported Materials Certification.
- n. Criminal Background Investigation/Fingerprinting Certification.
- o. Buy American Certification.

Failure to comply with these conditions within the time specified will entitle District to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited, as well as any other rights the District may have against the Contractor.

After you comply with those conditions, District will return to you one fully signed counterpart of the Agreement.

**LODI UNIFIED SCHOOL DISTRICT**

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

END OF DOCUMENT

**AGREEMENT**

THIS AGREEMENT IS MADE AND ENTERED INTO THIS \_\_\_\_\_ DAY OF \_\_\_\_\_  
\_\_\_\_\_, 20\_\_\_\_, by and between the Lodi Unified School District ("District") and \_\_\_\_\_  
\_\_\_\_\_ ("Contractor") ("Agreement").

**WITNESSETH:** That the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree with each other, as follows:

- 1. The Work:** Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, and material necessary to perform and complete in a good and workmanlike manner, the work of the following project:

**Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2**

("Project" or "Contract" or "Work")

It is understood and agreed that the Work shall be performed and completed as required in the Contract Documents including, without limitation, the Drawings and Specifications and submission of all documents required to secure funding or by the Division of the State Architect for close-out of the Project, under the direction and supervision of, and subject to the approval of, the District or its authorized representative.

- 2. The Contract Documents:** The complete Contract consists of all Contract Documents as defined in the General Conditions and incorporated herein by this reference. Any and all obligations of the District and Contractor are fully set forth and described in the Contract Documents. All Contract Documents are intended to cooperate so that any Work called for in one and not mentioned in the other or vice versa is to be executed the same as if mentioned in all Contract Documents.
- 3. Interpretation of Contract Documents:** Should any question arise concerning the intent or meaning of Contract Documents, including the Drawings or Specifications, the question shall be submitted to the District for interpretation. If a conflict exists in the Contract Documents, valid, written modifications, beginning with the most recent, shall control over this Agreement (if any), which shall control over the Special Conditions, which shall control over any Supplemental Conditions, which shall control over the General Conditions, which shall control over the remaining Division 0 documents, which shall control over Division 1 Documents which shall control over Division 2 through Division 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In no case shall a document calling for lower quality and/or quantity material or workmanship control. The decision of the District in the matter shall be final.
- 4. Time for Completion:** It is hereby understood and agreed that the Work under this Contract shall be completed within two hundred forty (240) consecutive calendar days ("Contract Time") from the date specified in the District's Notice to Proceed.

**5. Completion - Extension of Time:** Should the Contractor fail to complete this Contract, and the Work provided herein, within the time fixed for completion, due allowance being made for the contingencies provided for herein, the Contractor shall become liable to the District for all loss and damage that the District may suffer on account thereof. The Contractor shall coordinate its Work with the Work of all other contractors. The District shall not be liable for delays resulting from Contractor's failure to coordinate its Work with other contractors in a manner that will allow timely completion of Contractor's Work. Contractor shall be liable for delays to other contractors caused by Contractor's failure to coordinate its Work with the Work of other contractors.

**6. Liquidated Damages:** Time is of the essence for all work under this Agreement. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that the District will sustain in the event of and by reason of Contractor's delay; therefore, Contractor agrees that it shall pay to the District the sum of Five Hundred Dollars (\$500.00) per day as liquidated damages for each and every day's delay beyond the time herein prescribed in finishing the Work.

It is hereby understood and agreed that this amount is not a penalty.

In the event that any portion of the liquidated damages is not paid to the District, the District may deduct that amount from any money due or that may become due the Contractor under this Agreement, and such deduction does not constitute a withholding or penalty. The District's right to assess liquidated damages is as indicated herein and in the General Conditions.

The time during which the Contract is delayed for cause, as hereinafter specified, may extend the time of completion for a reasonable time as the District may grant, provided that Contractor has complied with the claims procedure of the Contract Documents. This provision does not exclude the recovery of damages by either party under other provisions in the Contract Documents.

**7. Loss Or Damage:** The District and its agents and authorized representatives shall not in any way or manner be answerable or suffer loss, damage, expense, or liability for any loss or damage that may happen to the Work, or any part thereof, or in or about the same during its construction and before acceptance, and the Contractor shall assume all liabilities of every kind or nature arising from the Work, either by accident, negligence, theft, vandalism, or any cause whatsoever; and shall hold the District and its agents and authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatsoever.

**8. Insurance and Bonds:** Prior to issuance of the Notice to Proceed by the District, Contractor shall provide all required certificates of insurance, insurance endorsements, and payment and performance bonds as evidence thereof.

**9. Prosecution of Work:** If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this Contract, the District, may, pursuant to the General Conditions and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

- 10. Authority of Architect, Project Inspector, and DSA:** Contractor hereby acknowledges that the Architect(s), the Project Inspector(s), and the Division of the State Architect ("DSA") have authority to approve and/or suspend Work if the Contractor's Work does not comply with the requirements of the Contract Documents, Title 24 of the California Code of Regulations, and all applicable laws and regulations. The Contractor shall be liable for any delay caused by its non-compliant Work.
- 11. Assignment of Contract:** Neither the Contract, nor any part thereof, nor any moneys due or to become due thereunder, may be assigned by the Contractor without the prior written approval of the District, nor without the written consent of the Surety on the Contractor's Performance Bond (the "Surety"), unless the Surety has waived in writing its right to notice of assignment.
- 12. Classification of Contractor's License:** Contractor hereby acknowledges that it currently holds valid Type Class B, General Building, C-20, Warm-Air Heating, Ventilating & Air Conditioning. Contractor's license(s) issued by the State of California, Contractors' State License Board, in accordance with division 3, chapter 9, of the Business and Professions Code and in the classification called for in the Contract Documents.
- 13. Registration as Public Works Contractor:** The Contractor and all Subcontractors currently are registered as public works contractors with the Department of Industrial Relations, State of California, in accordance with Labor Code section 1771.1.
- 14. Payment of Prevailing Wages:** The Contractor and all Subcontractors shall pay all workers on all Work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code. The Contractor and all Subcontractors shall comply with the Davis Bacon Act, applicable reporting requirements, and any other applicable requirements for federal funding. If a conflict exists, the more stringent provision shall control over this Agreement.
- 15.** This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and Title 8 of the California Code of Regulations. Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code, including, without limitation, the requirement that the Contractor and all of its Subcontractors shall timely submit complete and accurate electronic certified payroll records as required by the Contract Documents, or the District may not issue payment.
- 16. Contract Price:** In consideration of the foregoing covenants, promises, and agreements on the part of the Contractor, and the strict and literal fulfillment of each and every covenant, promise, and agreement, and as compensation agreed upon for the Work and construction, erection, and completion as aforesaid, the District covenants, promises, and agrees that it will well and truly pay and cause to be paid to the Contractor in full, and as the full Contract Price and compensation for



construction, erection, and completion of the Work hereinabove agreed to be performed by the Contractor, the following price:

\_\_\_\_\_ **Dollars**  
( \$ \_\_\_\_\_ ),

in lawful money of the United States, which sum is to be paid according to the schedule provided by the Contractor and accepted by the District and subject to additions and deductions as provided in the Contract. This amount supersedes any previously stated and/or agreed to amount(s).

- 17. No Representations:** No representations have been made other than as set forth in writing in the Contract Documents, including this Agreement. Each of the Parties to this Agreement warrants that it has carefully read and understood the terms and conditions of this Agreement and all Contract Documents, and that it has not relied upon the representations or advice of any other Party or any attorney not its own.
- 18. Entire Agreement:** The Contract Documents, including this Agreement, set forth the entire agreement between the parties hereto and fully supersede any and all prior agreements, understandings, written or oral, between the parties hereto pertaining to the subject matter thereof.
- 19. Severability:** If any term, covenant, condition, or provision in any of the Contract Documents is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the provisions in the Contract Documents shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby.

IN WITNESS WHEREOF, accepted and agreed on the date indicated above:

**CONTRACTOR**

**LODI UNIFIED SCHOOL DISTRICT**

\_\_\_\_\_  
By: \_\_\_\_\_

\_\_\_\_\_  
By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

NOTE: If the party executing this Contract is a corporation, a certified copy of the by-laws, or of the resolution of the Board of Directors, authorizing the officers of said corporation to execute the Contract and the bonds required thereby must be attached hereto.

END OF DOCUMENT

**NOTICE TO PROCEED**

Dated: \_\_\_\_\_, 20\_\_

TO: \_\_\_\_\_  
("Contractor")

ADDRESS: \_\_\_\_\_

PROJECT: \_\_\_\_\_

PROJECT/CONTRACT NO.: \_\_\_\_\_ between the Lodi Unified School District and Contractor ("Contract").

You are notified that the Contract Time under the above Contract will commence to run on \_\_\_\_\_, 20\_\_. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement executed by Contractor, the date of completion is July 26, 2023.

You must submit the following documents by 5:00 p.m. of the TENTH (10th) calendar day following the date of this Notice to Proceed:

- a. Contractor's preliminary schedule of construction.
- b. Contractor's preliminary schedule of values for all of the Work.
- c. Contractor's preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals
- d. Contractor's Safety Plan specifically adapted for the Project.
- e. Registered Subcontractors List: A complete subcontractors list for all tiers, including the name, address, telephone number, email address, facsimile number, California State Contractors License number, license classification, Department of Industrial Relations registration number, and monetary value of all Subcontracts.

Thank you. We look forward to a very successful Project.

LODI UNIFIED SCHOOL DISTRICT

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

END OF DOCUMENT

**ESCROW BID DOCUMENTATION**

**1. Requirement to Escrow Bid Documentation**

- a. Contractor shall submit, within **SEVEN (7)** calendar days after the date of the Notice of Award, one copy of all documentary information received or generated by Contractor in preparation of bid prices for this Contract, as specified herein. This material is referred to herein as "Escrow Bid Documentation." The Escrow Bid Documentation of the Contractor will be held in escrow for the duration of the Contract.
- b. Contractor agrees, as a condition of award of the Contract, that the Escrow Bid Documentation constitutes all written information used in the preparation of its bid, and that no other written bid preparation information shall be considered in resolving disputes or claims. Contractor also agrees that nothing in the Escrow Bid Documentation shall change or modify the terms or conditions of the Contract Documents.
- c. The Escrow Bid Documentation will not be opened by District except as indicated herein. The Escrow Bid Documentation will be used only for the resolution of change orders and claims disputes.
- d. Contractor's submission of the Escrow Bid Documentation, as with the bonds and insurance documents required, is considered an essential part of the Contract award. Should the Contractor fail to make the submission within the allowed time specified above, District may deem the Contractor to have failed to enter into the Contract, and the Contractor shall forfeit the amount of its bid security, accompanying the Contractor's bid, and District may award the Contract to the next lowest responsive responsible bidder.
- e. NO PAYMENTS WILL BE MADE, NOR WILL DISTRICT ACCEPT PROPOSED CHANGE ORDERS UNTIL THE ABOVE REQUIRED INFORMATION IS SUBMITTED AND APPROVED.
- f. The Escrow Bid Documentation shall be submitted in person by an authorized representative of the Contractor to the District.

**2. Ownership of Escrow Bid Documentation**

- a. The Escrow Bid Documentation is, and shall always remain, the property of Contractor, subject to review by District, as provided herein.
- b. Escrow Bid Documentation constitute trade secrets, not known outside Contractor's business, known only to a limited extent and only by a limited number of employees of Contractor, safeguarded while in Contractor's possession, extremely valuable to Contractor, and could be extremely valuable to Contractor's competitors by virtue of reflecting Contractor's contemplated techniques of construction. Subject to the provisions herein, District agrees to safeguard the Escrow Bid Documentation, and all

information contained therein, against disclosure to the fullest extent permitted by law.

### **3. Format and Contents of Escrow Bid Documentation**

- a. Contractor may submit Escrow Bid Documentation in its usual cost-estimating format; a standard format is not required. The Escrow Bid Documentation shall be submitted in the language (e.g., English) of the specification.
- b. Escrow Bid Documentation must clearly itemize the estimated costs of performing the work of each bid item contained in the bid schedule, separating bid items into sub-items as required to present a detailed cost estimate and allow a detailed cost review. The Escrow Bid Documentation shall include all subcontractor bids or quotes, supplier bids or quotes, quantity takeoffs, crews, equipment, calculations of rates of production and progress, copies of quotes from subcontractors and suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by the Contractor to arrive at the prices contained in the bid proposal. Estimated costs should be broken down into Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and subcontract costs as appropriate. Plant and equipment and indirect costs should be detailed in the Contractor's usual format. The Contractor's allocation of indirect costs, contingencies, markup, and other items to each bid item shall be identified.
- c. All costs shall be identified. For bid items amounting to less than \$10,000, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.
- d. Bid Documentation provided by District should not be included in the Escrow Bid Documentation unless needed to comply with the following requirements.

### **4. Submittal of Escrow Bid Documentation**

- a. The Escrow Bid Documentation shall be submitted by the Contractor in a sealed container within **SEVEN (7)** calendar days after the date of the Notice of Award. The container shall be clearly marked on the outside with the Contractor's name, date of submittal, project name and the words "Escrow Bid Documentation – Intended to be opened in the presence of Authorized Representatives of Both District and Contractor".
- b. By submitting Escrow Bid Documentation, Contractor represents that the material in the Escrow Bid Documentation constitutes all the documentary information used in preparation of the bid and that the Contractor has personally examined the contents of the Escrow Bid Documentation container and has found that the documents in the container are complete.

- c. If Contractor's proposal is based upon subcontracting any part of the work, each subcontractor whose total subcontract price exceeds 5 percent of the total contract price proposed by Contractor, shall provide separate Escrow Documents to be included with those of Contractor. Those documents shall be opened and examined in the same manner and at the same time as the examination described above for Contractor.
- d. If Contractor wishes to subcontract any portion of the Work after award, District retains the right to require Contractor to submit Escrow Documents for the Subcontractor before the subcontract is approved.

**5. Storage, Examination and Final Disposition of Escrow Bid Documentation**

- a. The Escrow Bid Documentation will be placed in escrow, for the life of the Contract, in a mutually agreeable institution. The cost of storage will be paid by Contractor for the duration of the project until final Contract payment. The storage facilities shall be the appropriate size for all the Escrow Bid Documentation and located conveniently to both District's and Contractor's offices.
- b. The Escrow Bid Documentation shall be examined by both District and Contractor, at any time deemed necessary by either District or Contractor, to assist in the negotiation of price adjustments and change orders or the settlement of disputes and claims. In the case of legal proceedings, Escrow Bid Documentation shall be used subject to the terms of an appropriate protective order if requested by Contractor and ordered by a court of competent jurisdiction. Examination of the Escrow Bid Documentation is subject to the following conditions:
  - (1) As trade secrets, the Escrow Bid Documentation is proprietary and confidential to the extent allowed by law.
  - (2) District and Contractor shall each designate, in writing to the other party **SEVEN (7)** calendar days prior to any examination, the names of representatives who are authorized to examine the Escrow Bid Documentation. No other person shall have access to the Escrow Bid Documentation.
  - (3) Access to the documents may take place only in the presence of duly designated representatives of the District and Contractor. If Contractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days' notice, then the District representative may examine the Escrow Bid Documents alone upon an additional **THREE (3)** calendar days' notice if a representative of the Contractor does not appear at the time set.
  - (4) If a subcontractor has submitted sealed information to be included in the Escrow Bid Documents, access to those documents may take place only in the presence of a duly designated representative of the District, Contractor and that subcontractor. If that subcontractor fails to designate a representative or appear for joint examination on **SEVEN (7)** calendar days' notice, then the District representative and/or the

Contractor may examine the Escrow Bid Documentation without that subcontractor present upon an additional **THREE (3)** calendar days' notice if a representative of that subcontractor does not appear at the time set.

- c. The Escrow Bid Documentation will be returned to Contractor at such time as the Contract has been completed and final settlement has been achieved.

END OF DOCUMENT

**ESCROW AGREEMENT IN LIEU OF RETENTION**  
**(Public Contract Code Section 22300)**

**(Note: Contractor must use this form.)**

This Escrow Agreement in Lieu of Retention ("Escrow Agreement") is made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between the Lodi Unified School District ("District"), whose address is 1305 E. Vine Street , Lodi , California 95240 , and \_\_\_\_\_ ("Contractor"), whose address is \_\_\_\_\_, and \_\_\_\_\_ ("Escrow Agent"), a state or federally chartered bank in the state of California, whose address is \_\_\_\_\_.

For the consideration hereinafter set forth, District, Contractor, and Escrow Agent agree as follows:

1. Pursuant to section 22300 of Public Contract Code of the State of California, which is hereby incorporated by reference, Contractor has the following two (2) options:
  - ☐ Deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by District pursuant to the Construction Contract No. \_\_\_\_\_ entered into between District and Contractor for the \_\_\_\_\_ Project, in the amount of \_\_\_\_\_ Dollars (\$\_\_\_\_\_) dated, \_\_\_\_\_, 20\_\_\_\_, (the "Contract"); **or**
  - ☐ On written request of Contractor, District shall make payments of the retention earnings for the above referenced Contract directly to Escrow Agent.

When Contractor deposits the securities as a substitute for Contract earnings (first option), Escrow Agent shall notify District within ten (10) calendar days of the deposit. The market value of the securities at the time of substitution and at all times from substitution until the termination of the Escrow Agreement shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between District and Contractor.

Securities shall be held in the name of Lodi Unified School District, and shall designate Contractor as beneficial owner.

2. District shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments pursuant to Contract provisions, provided that Escrow Agent holds securities in form and amount specified above.
3. When District makes payment of retentions earned directly to Escrow Agent, Escrow Agent shall hold them for the benefit of Contractor until the time that the escrow created under this Escrow Agreement is terminated. Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow Agreement and the rights and responsibilities of the Parties shall be equally applicable and binding when District pays Escrow Agent directly.

4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account, and all expenses of District. The District will charge Contractor \$0 for each of District's deposits to the escrow account. These expenses and payment terms shall be determined by District, Contractor, and Escrow Agent.
5. Interest earned on securities or money market accounts held in escrow and all interest earned on that interest shall be for sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to District.
6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from District to Escrow Agent that District consents to withdrawal of amount sought to be withdrawn by Contractor.
7. District shall have the right to draw upon the securities and/or withdraw amounts from the Escrow Account in the event of default by Contractor. Upon seven (7) days' written notice to Escrow Agent from District of the default, if applicable, Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by District. Escrow Agent shall not be authorized to determine the validity of any notice of default given by District pursuant to this paragraph, and shall promptly comply with District's instructions to pay over said escrowed assets. Escrow Agent further agrees to not interplead the escrowed assets in response to a conflicting demand.
8. Upon receipt of written notification from District certifying that the Contract is final and complete, and that Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all monies and securities on deposit and payments of fees and charges.
9. Escrow Agent shall rely on written notifications from District and Contractor pursuant to Paragraphs 5 through 8, inclusive, of this Escrow Agreement and District and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of securities and interest as set forth above.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]



10. Names of persons who are authorized to give written notice or to receive written notice on behalf of District and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of District:

CBO  
Title  
Leonard Kahn  
Name  
Signature  
1305 E Vine Street, Lodi, CA 95240  
Address

On behalf of Contractor:

Title  
Name  
Signature  
Address

On behalf of Escrow Agent:

Title  
Name  
Signature  
Address

At the time that the Escrow Account is opened, District and Contractor shall deliver to Escrow Agent a fully executed copy of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

On behalf of District:

Title  
Name  
Signature  
Address

On behalf of Contractor:

Title  
Name  
Signature  
Address

END OF DOCUMENT

**PERFORMANCE BOND**  
**(100% of Contract Price)**

**(Note: Contractor must use this form, NOT a surety company form.)**

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the governing board ("Board") of the Lodi Unified School District, ("District") and \_\_\_\_\_ ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

**Parklane and Victor Elementary Schools - HVAC Replacement**

("Project" or "Contract") which Contract dated \_\_\_\_\_, 20\_\_\_\_, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof; and

WHEREAS, said Principal is required under the terms of the Contract to furnish a bond for the faithful performance of the Contract.

NOW, THEREFORE, the Principal and \_\_\_\_\_ ("Surety") are held and firmly bound unto the Board of the District in the penal sum of \_\_\_\_\_

Dollars (\$\_\_\_\_\_), lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents, to:

- Promptly perform all the work required to complete the Project; and
- Pay to the District all damages the District incurs as a result of the Principal's failure to perform all the Work required to complete the Project.

Or, at the District's sole discretion and election, the Surety shall obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the District of the lowest responsible bidder, arrange for a contract between such bidder and the District and make available as Work progresses sufficient funds to pay the cost of completion less the "balance of the Contract Price," and to pay and perform all obligations of Principals under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages. The term "balance of the Contract Price," as used in this paragraph, shall mean the total amount payable to Principal by the District under the Contract and any modifications thereto, less the amount previously paid by the District to the Principal, less any withholdings by the District allowed under the Contract. District shall not be required or obligated to accept a tender of a completion contractor from the Surety for any or no reason.

The condition of the obligation is such that, if the above bound Principal, its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in the Contract and any alteration

thereof made as therein provided, on its part to be kept and performed at the time and in the intent and meaning, including all contractual guarantees and warranties of materials and workmanship, and shall indemnify and save harmless the District, its trustees, officers and agents, as therein stipulated, then this obligation shall become null and void, otherwise it shall be and remain in full force and virtue.

Surety expressly agrees that the District may reject any contractor or subcontractor proposed by Surety to fulfill its obligations in the event of default by the Principal. Surety shall not utilize Principal in completing the Work nor shall Surety accept a Bid from Principal for completion of the Work if the District declares the Principal to be in default and notifies Surety of the District's objection to Principal's further participation in the completion of the Work.

As a condition precedent to the satisfactory completion of the Contract, the above obligation shall hold good for a period equal to the warranty and/or guarantee period of the Contract, during which time Surety's obligation shall continue if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the District from loss or damage resulting from or caused by defective materials or faulty workmanship. The obligations of Surety hereunder shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the District's rights or the Contractor or Surety's obligations under the Contract, law or equity, including, but not limited to, California Code of Civil Procedure section 337.15.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond. The Surety also stipulates and agrees that it shall not be exonerated or released from the obligation of this bond by any overpayment or underpayment by the District that is based upon estimates approved by the Architect. The Surety does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the work or to the specifications.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

Principal	Surety
By	By
	Name of California Agent of Surety
	Address of California Agent of Surety
	Telephone No. of California Agent of Surety

**Contractor must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.**

END OF DOCUMENT

**PAYMENT BOND**  
**Contractor's Labor & Material Bond**  
**(100% Of Contract Price)**

**(Note: Contractor must use this form, NOT a surety company form.)**

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS the governing board ("Board") of the Lodi Unified School District, ("District") and \_\_\_\_\_, ("Principal") have entered into a contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to perform the following project:

**Parklane and Victor Elementary Schools - HVAC Replacement**

("Project" or "Contract") which Contract dated \_\_\_\_\_, 20\_\_\_\_, and all of the Contract Documents attached to or forming a part of the Contract, are hereby referred to and made a part hereof; and

WHEREAS, pursuant to law and the Contract, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by which the Contract is awarded in an amount equal to one hundred percent (100%) of the Contract price, to secure the claims to which reference is made in sections 9000 through 9510 and 9550 through 9566 of the Civil Code, and division 2, part 7, of the Labor Code.

NOW, THEREFORE, the Principal and \_\_\_\_\_ ("Surety") are held and firmly bound unto all laborers, material men, and other persons referred to in said statutes in the sum of \_\_\_\_\_ Dollars (\$\_\_\_\_\_), lawful money of the United States, being a sum not less than the total amount payable by the terms of Contract, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the Principal or any of its subcontractors, or their heirs, executors, administrators, successors, or assigns of any, all, or either of them shall fail to pay for any labor, materials, provisions, or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal or any of his or its subcontractors of any tier under Section 13020 of the Unemployment Insurance Code with respect to such work or labor, that the Surety will pay the same in an amount not exceeding the amount herein above set forth, and also in case suit is brought upon this bond, will pay a reasonable attorney's fee to be awarded and fixed by the court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims under section 9100 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void; otherwise it shall be and remain in full force and affect.

And the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of Contract or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original thereof, have been duly executed by the Principal and Surety above named, on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

Principal	Surety
By	By
	Name of California Agent of Surety
	Address of California Agent of Surety
	Telephone No. of California Agent of Surety

**Contractor must attach a Notarial Acknowledgment for all Surety's signatures and a Power of Attorney and Certificate of Authority for Surety. The California Department of Insurance must authorize the Surety to be an admitted surety insurer.**

END OF DOCUMENT

**ALLOWANCE EXPENDITURE DIRECTIVE FORM**

Lodi Unified School District  
1305 E. Vine Street  
Lodi, CA 95240

**ALLOWANCE  
EXPENDITURE  
DIRECTIVE NO.:**

**ALLOWANCE EXPENDITURE DIRECTIVE**

**Project:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Bid No.:** \_\_\_\_\_

**DSA File No.:** \_\_\_\_\_

**DSA Appl. No.:** \_\_\_\_\_

The following parties agree to the terms of this Allowance Expenditure Directive ("AED"):

**Owner Name, Address, Telephone:**

**Contractor Name, Address, Telephone:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reference	Description	Allowance Authorized for Expenditure	Days Ext.
Request for AED # Requested by: Performed by: Reason:	[Description of unforeseen item relating to Work] [Requester] [Performer] [Reason]	\$	
Request for AED # Requested by: Performed by: Reason:	[Description of unforeseen item relating to Work] [Requester] [Performer] [Reason]	\$	
Request for AED # Requested by: Performed by: Reason:	[Description of unforeseen item relating to Work] [Requester] [Performer] [Reason]	\$	

Contract time will be adjusted as follows:	Total Contract Allowance Amount:	\$
Previous Completion Date: __[DATE]__	Amount of Previously Approved Allowance Expenditure Directive(s):	\$

_____ [#] _____ Calendar Days Extension (zero days unless otherwise indicated)  Current Completion Date: ____ [DATE] ____	Amount of this Allowance Expenditure Directive:	\$
--	--	----

The undersigned Contractor approves the foregoing release of allowance for completion of each specified item, and as to the extension of time allowed, if any, for completion of the entire work as stated therein, and agrees to furnish all labor, materials and services and perform all work necessary to complete any additional work specified for the consideration stated therein ("Work"). Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650, et seq.

This Allowance Expenditure Directive must be signed by an authorized District representative.

It is expressly understood that the authorized allowance expenditure and time, if any, granted herein represent a full accord and satisfaction for any and all time and cost impacts of the items herein, and Contractor waives any and all further compensation or time extension based on the items herein. The value of the extra work or changes expressly includes any and all of the Contractor's costs and expenses, and its subcontractors, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project. Any costs, expenses, damages or time extensions not included are deemed waived.

### Signatures:

<b>DISTRICT:</b>  LODI UNIFIED SCHOOL DISTRICT  Date: _____  By: _____ [Print Name and Title here]	<b>CONTRACTOR:</b>  _____  Date: _____  By: _____ [Print Name and Title here]
<b>ARCHITECT:</b>  _____  Date: _____  By: _____ [Print Name and Title here]	<b>PROJECT INSPECTOR:</b>  _____  Date: _____  By: _____ [Print Name and Title here]

END OF DOCUMENT

**PROPOSED CHANGE ORDER FORM**

Lodi Unified School District  
 1305 E. Vine Street  
 Lodi, CA 95240

**PCO NO.:**

**Project:** \_\_\_\_\_  
**Bid No.:** \_\_\_\_\_  
**RFI #:** \_\_\_\_\_

**Date:** \_\_\_\_\_  
**DSA File No.:** \_\_\_\_\_  
**DSA Appl. No.:** \_\_\_\_\_

Contractor hereby submits for District's review and evaluation this Proposed Change Order ("PCO"), submitted in accordance with and subject to the terms of the Contract Documents, including Sections 17.7 and 17.8 of the General Conditions. Any spaces left blank below are deemed no change to cost or time.

Contractor understands and acknowledges that documentation supporting Contractor's PCO must be attached and included for District review and evaluation. Contractor further understands and acknowledges that failure to include documentation sufficient to, in District's discretion, support some or all of the PCO, shall result in a rejected PCO.

	<b><u>WORK PERFORMED OTHER THAN BY CONTRACTOR</u></b>	<b><u>ADD</u></b>	<b><u>DEDUCT</u></b>
(a)	<b><u>Material</u></b> (attach suppliers' invoice or itemized quantity and unit cost plus sales tax)		
(b)	<b><u>Add Labor</u></b> (attach itemized hours and rates, fully encumbered)		
(c)	<b><u>Add Equipment</u></b> (attach suppliers' invoice)		
(d)	<b><u>Subtotal</u></b>		
(e)	<b><u>Add overhead and profit for any and all tiers of Subcontractor</u></b> , the total not to exceed ten percent (10%) of Item (d)		
(f)	<b><u>Subtotal</u></b>		
(g)	<b><u>Add Overhead and Profit for Contractor</u></b> , not to exceed five percent (5%) of Item (f)		
(h)	<b><u>Subtotal</u></b>		
(i)	<b><u>Add Bond and Insurance</u></b> , not to exceed one and a half percent (1.5%) of Item (h)		
(j)	<b><u>TOTAL</u></b>		
(k)	<b><u>Time</u></b> (zero unless indicated; "TBD" not permitted)	<b>____ Calendar Days</b>	

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	<b>WORK PERFORMED BY CONTRACTOR</b>	<b>ADD</b>	<b>DEDUCT</b>
(a)	<b>Material</b> (attach itemized quantity and unit cost plus sales tax)		
(b)	<b>Add Labor</b> (attach itemized hours and rates, fully encumbered)		
(c)	<b>Add Equipment</b> (attach suppliers' invoice)		
(d)	<b>Subtotal</b>		
(e)	<b>Add Overhead and Profit for Contractor</b> , not to exceed fifteen percent (15%) of Item (d)		
(f)	<b>Subtotal</b>		
(g)	<b>Add Bond and Insurance</b> , not to exceed one and a half percent (1.5%) of Item (f)		
(h)	<b>TOTAL</b>		
(i)	<b>Time</b> (zero unless indicated; "TBD" not permitted)	<b>Calendar Days</b>	

The undersigned Contractor approves the foregoing as to the changes, if any, to the Contract Price specified for each item, and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 *et seq.* It is understood that the changes herein to the Contract shall only be effective when approved by the governing board of the District.

It is expressly understood that the value of the extra Work or changes expressly includes any and all of the Contractor's costs and expenses, direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Contractor is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

**SUBMITTED BY:**

Contractor:

\_\_\_\_\_  
[Name]

\_\_\_\_\_  
Date

END OF DOCUMENT

**CHANGE ORDER FORM**

Lodi Unified School District  
1305 E. Vine Street  
Lodi, CA 95240

**CHANGE ORDER NO.:**

**CHANGE ORDER**

**Project:** \_\_\_\_\_  
**Bid No.:** \_\_\_\_\_

**Date:** \_\_\_\_\_  
**DSA File No.:** \_\_\_\_\_  
**DSA Appl. No.:** \_\_\_\_\_

The following parties agree to the terms of this Change Order:

**Owner:** \_\_\_\_\_  
[Name / Address]

**Contractor:** \_\_\_\_\_  
[Name / Address]

**Architect:** \_\_\_\_\_  
[Name / Address]

**Project Inspector:** \_\_\_\_\_  
[Name / Address]

Reference	Description	Cost	Days Ext.
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
PCO # Requested by: Performed by: Reason:	[Description of change] [Requester] [Performer] [Reason]	\$	
Contract time will be adjusted as follows:		Original Contract Amount:	\$
Previous Completion Date: __[Date]		Amount of Previously Approved Change Order(s):	\$
_____[#] Calendar Days Extension (zero unless otherwise indicated)		Amount of this Change Order:	\$
Current Completion Date: __[Date]		Contract Amount:	\$

The undersigned Contractor approves the foregoing as to the changes, if any, to the Contract Price specified for each item, and as to the extension of time allowed, if any, for

**LODI UNIFIED SCHOOL DISTRICT**

**CHANGE ORDER FORM  
DOCUMENT 00 63 63-1**

completion of the entire work as stated therein, and agrees to furnish all labor, materials and services and perform all work necessary to complete any additional work specified for the consideration stated therein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650, et seq.

This change order is subject to approval by the governing board of this District and must be signed by the District. Until such time as this change order is approved by the District's governing board and executed by a duly authorized District representative, this change order is not effective and not binding.

It is expressly understood that the compensation and time, if any, granted herein represent a full accord and satisfaction for any and all time and cost impacts of the items herein, and Contractor waives any and all further compensation or time extension based on the items herein. The value of the extra work or changes expressly includes any and all of the Contractor's costs and expenses, and its subcontractors, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project. Any costs, expenses, damages or time extensions not included are deemed waived.

**Signatures:**

District:

Contractor:

\_\_\_\_\_  
[Name]

\_\_\_\_\_  
Date

\_\_\_\_\_  
[Name]

\_\_\_\_\_  
Date

Architect:

Project Inspector:

\_\_\_\_\_  
[Name]

\_\_\_\_\_  
Date

\_\_\_\_\_  
[Name]

\_\_\_\_\_  
Date

END OF DOCUMENT

**AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS**

THIS AGREEMENT AND RELEASE OF CLAIMS ("Agreement and Release") IS MADE AND ENTERED INTO THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_ by and between the Lodi Unified School District ("District") and \_\_\_\_\_ ("Contractor"), whose place of business is \_\_\_\_\_.

RECITALS

**WHEREAS**, District and Contractor entered into PROJECT/CONTRACT NO.: **Parklane and Victor Elementary Schools - HVAC Replacement #3213-4416-2** ("Contract" or "Project") in the County of San Joaquin, California; and

**WHEREAS**, the Work under the Contract was completed on \_\_\_\_\_, and a Notice of Completion was recorded with the County Recorder on \_\_\_\_\_.

NOW, THEREFORE, it is mutually agreed between District and Contractor as follows:

AGREEMENT AND RELEASE

1. Contractor will only be assessed liquidated damages as detailed below:

Original Contract Sum \$ \_\_\_\_\_

Modified Contract Sum \$ \_\_\_\_\_

Payment to Date \$ \_\_\_\_\_

Liquidated Damages \$ \_\_\_\_\_

Payment Due Contractor \$ \_\_\_\_\_

2. Subject to the provisions hereof, District shall forthwith pay to Contractor the undisputed sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) under the Contract, less any amounts represented by any notice to withhold funds on file with District as of the date of such payment.
3. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against District arising from the performance of work under the Contract, except for the claims described in Paragraph 5 and continuing obligations described in Paragraph 6. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against District and all of its respective agents, employees, trustees, inspectors, assignees, consultants and transferees, except for any Disputed Claim that may be set forth in Paragraph 6 and the continuing obligations described in Paragraph 8 hereof.

4. The following claims are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

<u>Claim No.</u>	<u>Description of Claim</u>	<u>Amount of Claim</u>	<u>Date Claim Submitted</u>
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____
_____	_____	\$ _____	_____

[If further space is required, attach additional sheets showing the required information.]

5. Consistent with California Public Contract Code section 7100, Contractor hereby agrees that, in consideration of the payment set forth in Paragraph 1 hereof, Contractor hereby releases and forever discharges District, all its agents, employees, inspectors, assignees, and transferees from any and all liability, claims, demands, actions, or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.
6. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, including without limitation the duty to defend, indemnify and hold harmless the District, shall remain in full force and effect as specified in the Contract Documents.
7. Contractor hereby waives the provisions of California Civil Code section 1542 which provides as follows:

A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS THAT THE CREDITOR OR RELEASING PARTY DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE AND THAT, IF KNOWN BY HIM OR HER, WOULD HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR OR RELEASED PARTY.

8. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable. If any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal, or other law, ruling, or regulations, then such provision, or part thereof, shall remain in force and effect to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.

9. All rights of District shall survive completion of the Work or termination of Contract, and execution of this Release.

\* \* \* CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING \* \* \*

LODI UNIFIED SCHOOL DISTRICT

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

END OF DOCUMENT

**GUARANTEE FORM**

\_\_\_\_\_ ("Contractor") hereby agrees that the \_\_\_\_\_  
\_\_\_\_\_ ("Work" of Contractor) which Contractor has installed for the Lodi Unified  
School District ("District") for the following project:

**PROJECT: *Parklane and Victor Elementary Schools - HVAC Replacement***

("Project" or "Contract") has been performed in accordance with the requirements of the  
Contract Documents and that the Work as installed will fulfill the requirements of the  
Contract Documents.

The undersigned agrees to repair or replace any or all of such Work that may prove to be  
defective in workmanship or material together with any other adjacent Work that may be  
displaced in connection with such replacement within a period of Two (2) year(s) from the  
date of completion as defined in Public Contract Code section 7107, subdivision (c), ordinary  
wear and tear and unusual abuse or neglect excepted. The date of completion is  
\_\_\_\_\_, 20\_\_\_\_.

In the event of the undersigned's failure to comply with the above-mentioned conditions  
within a reasonable period of time, as determined by the District, but not later than seven  
(7) days after being notified in writing by the District, the undersigned authorizes the  
District to proceed to have said defects repaired and made good at the expense of the  
undersigned. The undersigned shall pay the costs and charges therefor upon demand.

Date: \_\_\_\_\_

Proper Name of Contractor: \_\_\_\_\_

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Representatives to be contacted for service subject to terms of Contract:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone No.: \_\_\_\_\_

Email: \_\_\_\_\_

END OF DOCUMENT

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**GENERAL CONDITIONS**

**1. CONTRACT TERMS AND DEFINITIONS**

**1.1 Definitions**

**Wherever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof:**

**1.1.1 Adverse Weather:** Shall be only weather that satisfies all of the following conditions: (1) unusually severe precipitation, sleet, snow, hail, or extreme temperature conditions in excess of the norm for the location and time of year it occurred based on the closest weather station data averaged over the past five years, (2) that is unanticipated and would cause unsafe work conditions and/or is unsuitable for scheduled work that should not be performed during inclement weather (i.e., exterior finishes), and (3) at the Project.

**1.1.2 Allowance Expenditure Directive:** Written authorization for expenditure of allowance, if any.

**1.1.3 Approval, Approved, and/or Accepted:** Written authorization, unless stated otherwise.

**1.1.4 Architect (or "Design Professional in General Responsible Charge"):** The individual, partnership, corporation, joint venture, or any combination thereof, named as Architect, who will have the rights and authority assigned to the Architect in the Contract Documents. The term Architect means the Design Professional in General Responsible Charge as defined in DSA PR 13-02 on this Project or the Architect's authorized representative.

**1.1.5 As-Builts:** Reproducible blue line prints of drawings to be prepared on a monthly basis pursuant to the Contract Documents, that reflect changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed since the preceding monthly submittal. See **Record Drawings**.

**1.1.6 Bidder:** A contractor who intends to provide a proposal to the District to perform the Work of this Contract.

**1.1.7 Change Order:** A written order to the Contractor authorizing an addition to, deletion from, or revision in the Work, and/or authorizing an adjustment in the Contract Price or Contract Time.

**1.1.8 Claim:** A Dispute that remains unresolved at the conclusion of the all the applicable Dispute Resolution requirements provided herein.

**1.1.9 Construction Change Directive:** A written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work.

**1.1.10 Construction Manager:** The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Construction Manager is used on the Project that is the subject of this Contract, then all references to Construction Manager herein shall be read to refer to District.

**1.1.11 Construction Schedule:** The progress schedule of construction of the Project as provided by Contractor and approved by District.

**1.1.12 Contract, Contract Documents:** The Contract consists exclusively of the documents evidencing the agreement of the District and Contractor, identified as the Contract Documents. The Contract Documents consist of the following documents:

- 1.1.12.1** Notice to Bidders
- 1.1.12.2** Instructions to Bidders
- 1.1.12.3** Bid Form and Proposal
- 1.1.12.4** Bid Bond
- 1.1.12.5** Designated Subcontractors List
- 1.1.12.6** Site Visit Certification (if a site visit was required)
- 1.1.12.7** Non-Collusion Declaration
- 1.1.12.8** Notice of Award
- 1.1.12.9** Notice to Proceed
- 1.1.12.10** Agreement
- 1.1.12.11** Escrow of Bid Documentation
- 1.1.12.12** Escrow Agreement for Security Deposits in Lieu of Retention (if applicable)
- 1.1.12.13** Performance Bond
- 1.1.12.14** Payment Bond (Contractor's Labor & Material Bond)
- 1.1.12.15** General Conditions
- 1.1.12.16** Special Conditions (if applicable)
- 1.1.12.17** Project Labor Agreement (if applicable)
- 1.1.12.18** Hazardous Materials Procedures and Requirements
- 1.1.12.19** Workers' Compensation Certification
- 1.1.12.20** Prevailing Wage Certification
- 1.1.12.21** Disabled Veteran Business Enterprise Participation Certification (if applicable)
- 1.1.12.22** Drug-Free Workplace Certification (if applicable)
- 1.1.12.23** Tobacco-Free Environment Certification
- 1.1.12.24** Hazardous Materials Certification (if applicable)
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- 1.1.12.32** Post Bid Interview
- 1.1.12.33** All Plans, Technical Specifications, and Drawings
- 1.1.12.34** Any and all addenda to any of the above documents
- 1.1.12.35** Any and all change orders or written modifications to the above documents if approved in writing by the District

**1.1.13 Contract Price:** The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

**1.1.14 Contract Time:** The time period stated in the Agreement for the completion of the Work.

**1.1.15 Contractor:** The person or persons identified in the Agreement as contracting to perform the Work to be done under this Contract, or the legal representative of such a person or persons.

**1.1.16 Daily Job Report(s):** Daily Project reports prepared by the Contractor's employee(s) who are present on Site, which shall include the information required herein.

**1.1.17 Day(s):** Unless otherwise designated, day(s) means calendar day(s).

**1.1.18 Department of Industrial Relations (or "DIR"):** is responsible, among other things, for labor compliance monitoring and enforcement of California prevailing wage laws and regulations for public works contracts.

**1.1.19 Design Professional in General Responsible Charge:** See definition of **Architect** above.

**1.1.20 Dispute:** A separate demand by Contractor for a time extension, or payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or Contractor is not otherwise entitled to; or an amount of payment disputed by the District.

**1.1.21 District:** The public agency or the school district for which the Work is performed. The governing board of the District or its designees will act for the District in all matters pertaining to the Contract. The District may, at any time,

**1.1.21.1** Direct the Contractor to communicate with or provide notice to the Construction Manager or the Architect on matters for which the Contract Documents indicate the Contractor will communicate with or provide notice to the District; and/or

**1.1.21.2** Direct the Construction Manager or the Architect to communicate with or direct the Contractor on matters for which the Contract Documents indicate the District will communicate with or direct the Contractor.

**1.1.22 Drawings (or "Plans"):** The graphic and pictorial portions of the Contract Documents showing the design, location, scope and dimensions of the work, generally including plans, elevations, sections, details, schedules, sequence of operation, and diagrams.

**1.1.23 DSA:** Division of the State Architect.

**1.1.24 Force Account Directive:** A process that may be used when the District and the Contractor cannot agree on a price for a specific portion of work or before the Contractor prepares a price for a specific portion of work and whereby



the Contractor performs the work as indicated herein on a time and materials basis.

**1.1.25 Job Cost Reports:** Any and all reports or records detailing the costs associated with work performed on or related to the Project that Contractor shall maintain for the Project. Specifically, Job Cost Reports shall contain, but are not limited by or to, the following information: a description of the work performed or to be performed on the Project; quantity, if applicable, of work performed (hours, square feet, cubic yards, pounds, etc.) for the Project; Project budget; costs for the Project to date; estimated costs to complete the Project; and expected costs at completion. The Job Cost Reports shall also reflect all Contract cost codes, change orders, elements of non-conforming work, back charges, and additional services.

**1.1.26 Labor Commissioner's Office (or "Labor Commissioner", also known as the Division of Labor Standards Enforcement ("DLSE")):** Division of the DIR responsible for adjudicating wage claims, investigating discrimination and public works complaints, and enforcing Labor Code statutes and Industrial Welfare Commission orders.

**1.1.27 Municipal Separate Storm Sewer System (or "MS4"):** A system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

**1.1.28 Plans:** See **Drawings**.

**1.1.29 Premises:** The real property owned by the District on which the Site is located.

**1.1.30 Product(s):** New material, machinery, components, equipment, fixtures and systems forming the Work, including existing materials or components required and approved by the District for reuse.

**1.1.31 Product Data:** Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

**1.1.32 Program Manager:** The individual, partnership, corporation, joint venture, or any combination thereof, or its authorized representative, named as such by the District. If no Program Manager is designated for Project that is the subject of this Contract, then all references to Project Manager herein shall be read to refer to District.

**1.1.33 Project:** The planned undertaking as provided for in the Contract Documents.

**1.1.34 Project Inspector (or "Inspector"):** The individual(s) retained by the District in accordance with title 24 of the California Code of Regulations to monitor and inspect the Project.

**1.1.35 Project Labor Agreement (or "PLA"):** a prehire collective bargaining agreement in accordance with Public Contract Code section 2500 et seq. that establishes terms and conditions of employment for a specific construction project or projects and/or is an agreement described in Section 158(f) of Title 29 of the United States Code.

**1.1.36 Proposed Change Order (or "PCO"):** a written request prepared by the Contractor requesting that the District and the Architect issue a Change Order based upon a proposed change to the Work.

**1.1.37 Provide:** Shall include "provide complete in place," that is, "furnish and install," and "provide complete and functioning as intended in place" unless specifically stated otherwise.

**1.1.38 Qualified SWPPP Practitioners (or "QSP"):** certified personnel that attended a State Water Resources Control Board sponsored or approved training class and passed the qualifying exam.

**1.1.39 Record Drawings:** Reproducible drawings (or Plans) prepared pursuant to the requirements of the Contract Documents that reflect all changes made during the performance of the Work, recording differences between the original design of the Work and the Work as constructed upon completion of the Project. See also **As-Builts**.

**1.1.40 Request for Information (or "RFI"):** A written request prepared by the Contractor requesting that the Architect provide additional information necessary to clarify or amplify an item in the Contract Documents that the Contractor believes is not clearly shown or called for in the Drawings or Specifications or other portions of the Contract Documents, or to address problems that have arisen under field conditions.

**1.1.41 Request for Substitution for Specified Item:** A request by Contractor to substitute an equal or superior material, product, thing, or service for a specific material, product, thing, or service that has been designated in the Contract Documents by a specific brand or trade name.

**1.1.42 Safety Orders:** Written and/or verbal orders for construction issued by the California Division of Occupational Safety and Health ("CalOSHA") or by the United States Occupational Safety and Health Administration ("OSHA").

**1.1.43 Safety Plan:** Contractor's safety plan specifically adapted for the Project. Contractor's Safety Plan shall comply with all provisions regarding Project safety, including all applicable provisions in these General Conditions.

**1.1.44 Samples:** Physical examples that illustrate materials, products, equipment, finishes, colors, or workmanship and that, when approved in accordance with the Contract Documents, establish standards by which portions of the Work will be judged.

**1.1.45 Shop Drawings:** All drawings, prints, diagrams, illustrations, brochures, schedules, and other data that are prepared by the Contractor, a subcontractor, manufacturer, supplier, or distributor, that illustrate how specific portions of the Work shall be fabricated or installed.

**1.1.46 Site:** The Project site as shown on the Drawings.

**1.1.47 Specifications:** That portion of the Contract Documents, Division 1 through Division 49, and all technical sections, and addenda to all of these, if any, consisting of written descriptions and requirements of a technical nature of materials, equipment, construction methods and systems, standards, and workmanship.

**1.1.48 State:** The State of California.

**1.1.49 Storm Water Pollution Prevention Plan (or "SWPPP"):** A document which identifies sources and activities at a particular facility that may contribute pollutants to storm water and contains specific control measures and time frames to prevent or treat such pollutants.

**1.1.50 Subcontractor:** A contractor and/or supplier who is under contract with the Contractor or with any other subcontractor, regardless of tier, to perform a portion of the Work of the Project.

**1.1.51 Submittal Schedule:** The schedule of submittals as provided by Contractor and approved by District.

**1.1.52 Surety:** The person, firm, or corporation that executes as surety the Contractor's Performance Bond and Payment Bond, and must be a California admitted surety insurer as defined in the Code of Civil Procedure section 995.120.

**1.1.53 Work:** All labor, materials, equipment, components, appliances, supervision, coordination, and services required by, or reasonably inferred from, the Contract Documents, that are necessary for the construction and completion of the Project.

## **1.2 Laws Concerning the Contract**

Contract is subject to all provisions of the Constitution and laws of California and the United States governing, controlling, or affecting District, or the property, funds, operations, or powers of District, and such provisions are by this reference made a part hereof. Any provision required by law to be included in this Contract shall be deemed to be inserted.

## **1.3 No Oral Agreements**

No oral agreement or conversation with any officer, agent, or employee of District, either before or after execution of Contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the Contract.

## **1.4 No Assignment**

Contractor shall not assign this Contract or any part thereof including, without limitation, any services or money to become due hereunder without the prior written consent of the District. Assignment without District's prior written consent shall be null and void. Any assignment of money due or to become due under this Contract shall be subject to a prior lien for services rendered or material supplied for performance of work called for under this Contract in favor of all persons, firms, or corporations rendering services or

supplying material to the extent that claims are filed pursuant to the Civil Code, Code of Civil Procedure, Government Code, Labor Code, and/or Public Contract Code, and shall also be subject to deductions for liquidated damages or withholding of payments as determined by District in accordance with this Contract. Contractor shall not assign or transfer in any manner to a Subcontractor or supplier the right to prosecute or maintain an action against the District.

## **1.5      Notice and Service Thereof**

**1.5.1**      Any notice from one party to the other or otherwise under Contract shall be in writing and shall be dated and signed by the party giving notice or by a duly authorized representative of that party. Any notice shall not be effective for any purpose whatsoever unless served in one of the following manners:

**1.5.1.1**    If notice is given by personal delivery thereof, it shall be considered delivered on the day of delivery.

**1.5.1.2**    If notice is given by overnight delivery service, it shall be considered delivered one (1) day after date deposited, as indicated by the delivery service.

**1.5.1.3**    If notice is given by depositing same in United States mail, enclosed in a sealed envelope, it shall be considered delivered three (3) days after date deposited, as indicated by the postmarked date.

**1.5.1.4**    If notice is given by registered or certified mail with postage prepaid, return receipt requested, it shall be considered delivered on the day the notice is signed for.

**1.5.1.5**    Electronic mail may be used for convenience but is not a substitute for the notice and service requirements herein.

## **1.6      No Waiver**

The failure of District in any one or more instances to insist upon strict performance of any of the terms of this Contract or to exercise any option herein conferred shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion. No action or failure to act by the District, Architect, or Construction Manager shall constitute a waiver of any right or duty afforded the District under the Contract, nor shall any action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

## **1.7      Substitutions for Specified Items**

Unless the Special Conditions contain different provisions, Contractor shall not substitute different items for any items identified in the Contract Documents without prior written approval of the District.

## **1.8      Materials and Work**

**1.8.1**      Except as otherwise specifically stated in this Contract, Contractor shall provide and pay for all materials, labor, tools, equipment, transportation, supervision, temporary constructions of every nature, and all other services,

management, and facilities of every nature whatsoever necessary to execute and complete this Contract, in a good and workmanlike manner, within the Contract Time.

**1.8.2** Unless otherwise specified, all materials shall be new and of the best quality of their respective kinds and grades as noted or specified, workmanship shall be of good quality, and Contractor shall use all diligence to inform itself fully as to the required manufacturer's instructions and to comply therewith.

**1.8.3** Materials shall be furnished in ample quantities and at such times as to insure uninterrupted progress of Work and shall be stored properly and protected from the elements, theft, vandalism, or other loss or damage as required.

**1.8.4** For all materials and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems, functioning as intended. Incidental items not indicated on Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized here in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer's most recent published recommendations and specifications.

**1.8.5** Contractor shall, after award of Contract by District and after relevant submittals have been approved, place orders for materials and/or equipment as specified so that delivery of same may be made without delays to the Work. Contractor shall, upon demand from District, present documentary evidence showing that orders have been placed.

**1.8.6** District reserves the right but has no obligation, in response to Contractor's neglect or failure in complying with the above instructions, to place orders for such materials and/or equipment as the District may deem advisable in order that the Work may be completed at the date specified in the Agreement, and all expenses incidental to the procuring of said materials and/or equipment shall be paid for by Contractor or deducted from payment(s) to Contractor.

**1.8.7** Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver the Site to District, together with all improvements and appurtenances constructed or placed thereon by it, and free from any claims, liens, or charges. Contractor further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract shall have any right to lien any portion of the Premises or any improvement or appurtenance thereon, except that Contractor may install metering devices or other equipment of utility companies or of political subdivision, title to which is commonly retained by utility company or political subdivision. In the event of installation of any such metering device or equipment, Contractor shall advise District as to owner thereof.

**1.8.7.1** If a lien or a claim based on a stop payment notice of any nature should at any time be filed against the Work or any District property, by any entity that has supplied material or services at the request of the Contractor, Contractor and Contractor's Surety shall promptly, on demand by District and at

Contractor's and Surety's own expense, take any and all action necessary to cause any such lien or a claim based on a stop payment notice to be released or discharged immediately therefrom.

**1.8.7.2** If the Contractor fails to furnish to the District within ten (10) calendar days after demand by the District, satisfactory evidence that a lien or a claim based on a stop payment notice has been so released, discharged, or secured, the District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney's fees and expense incurred or suffered by District from any sum payable to Contractor under the Contract.

**1.8.8** Nothing contained in this Article, however, shall defeat or impair the rights of persons furnishing materials or labor under any bond given by Contractor for their protection or any rights under any law permitting such protection or any rights under any law permitting such persons to look to funds due Contractor in hands of District (e.g., stop payment notices), and this provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for work when no formal contract is entered into for such material.

**1.8.9** Title to new materials and/or equipment for the Work of this Contract and attendant liability for its protection and safety shall remain with Contractor until incorporated in the Work of this Contract and accepted by District. No part of any materials and/or equipment shall be removed from its place of storage except for immediate installation in the Work of this Contract. Should the District, in its discretion, allow the Contractor to store materials and/or equipment for the Work off-site, Contractor will store said materials and/or equipment at a bonded warehouse and with appropriate insurance coverage at no cost to District. Contractor shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to District or its authorized representative and shall, at the District's request, forward it to the District.

**2. [RESERVED]**

**3. ARCHITECT**

**3.1** The Architect shall represent the District during the Project and will observe the progress and quality of the Work on behalf of the District. Architect shall have the authority to act on behalf of District to the extent expressly provided in the Contract Documents and to the extent determined by District. Architect shall have authority to reject materials, workmanship, and/or the Work whenever rejection may be necessary, in Architect's reasonable opinion, to insure the proper execution of the Contract.

**3.2** Architect shall, with the District and on behalf of the District, determine the amount, quality, acceptability, and fitness of all parts of the Work, and interpret the Specifications, Drawings, and shall, with the District, interpret all other Contract Documents.

**3.3** Architect shall have all authority and responsibility established by law, including title 24 of the California Code of Regulations.

**3.4** Contractor shall provide District and the Construction Manager with a copy of all written communication between Contractor and Architect at the same time as that communication is made to Architect, including, without limitation, all RFIs, correspondence, submittals, claims, and proposed change orders.

#### **4. CONSTRUCTION MANAGER**

**4.1** If a Construction Manager is used on this Project ("Construction Manager" or "CM"), the Construction Manager will provide administration of the Contract on the District's behalf. After execution of the Contract and Notice to Proceed, all correspondence and/or instructions from Contractor and/or District shall be forwarded through the Construction Manager. The Construction Manager will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures or for safety precautions in connection with the Work, which shall all remain the Contractor's responsibility.

**4.2** The Construction Manager, however, will have authority to reject materials and/or workmanship not conforming to the Contract Documents, as determined by the District, the Architect, and/or the Project Inspector. The Construction Manager shall also have the authority to require special inspection or testing of any portion of the Work, whether it has been fabricated, installed, or fully completed. Any decision made by the Construction Manager, in good faith, shall not give rise to any duty or responsibility of the Construction Manager to: the Contractor; any Subcontractor; the Contractor or Subcontractor's respective agents, employees; or other persons performing any of the Work. The Construction Manager shall have free access to any or all parts of Work at any time.

**4.3** If the District does not use a Construction Manager on this Project, all references to Construction Manager or CM shall be read as District.

#### **5. INSPECTOR, INSPECTIONS, AND TESTS**

##### **5.1 Project Inspector**

**5.1.1** One or more Project Inspector(s), including special Project Inspector(s), as required, will be assigned to the Work by District, in accordance with requirements of title 24, part 1, of the California Code of Regulations, to enforce the building code and monitor compliance with Plans and Specifications for the Project previously approved by the DSA. Duties of Project Inspector(s) are specifically defined in section 4-342 of said part 1 of title 24.

**5.1.2** No Work shall be carried on except with the knowledge and under the inspection of the Project Inspector(s). The Project Inspector(s) shall have free access to any or all parts of Work at any time. Contractor shall furnish Project Inspector(s) reasonable opportunities for obtaining such information as may be necessary to keep Project Inspector(s) fully informed respecting progress and manner of work and character of materials, including, but not limited to, submission of form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector at least 48 hours in advance of the commencement and completion of construction of each and every aspect of the Work. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>. Inspection of Work shall not relieve Contractor from an obligation to fulfill this Contract. Project Inspector(s) and the

DSA are authorized to suspend work whenever the Contractor and/or its Subcontractor(s) are not complying with the Contract Documents. Any work stoppage by the Project Inspector(s) and/or DSA shall be without liability to the District. Contractor shall instruct its Subcontractors and employees accordingly.

**5.1.3** If Contractor and/or any Subcontractor requests that the Project Inspector(s) perform any inspection off-site, this shall only be done if it is allowable pursuant to applicable regulations and DSA approval, if the Project Inspector(s) agree to do so, and at the expense of the Contractor.

## **5.2 Tests and Inspections**

**5.2.1** Tests and Inspections shall comply with title 24, part 1, California Code of Regulations, group 1, article 5, section 4-335, and with the provisions of the Specifications.

**5.2.2** The District will select an independent testing laboratory to conduct the tests. Selection of the materials required to be tested shall be by the laboratory or the District's representative and not by the Contractor. The Contractor shall notify the District's representative a sufficient time in advance of its readiness for required observation or inspection.

**5.2.3** The Contractor shall notify the District's representative a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents, which must by terms of the Contract Documents be tested, in order that the District may arrange for the testing of same at the source of supply. This notice shall be provided, at a minimum, seventy-two (72) hours prior to the manufacture of the material that needs to be tested.

**5.2.4** Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated into and/or onto the Project.

**5.2.5** The District will select the testing laboratory and pay for the cost of all tests and inspections. Contractor shall reimburse the District for any and all laboratory costs or other testing costs for any materials found to be not in compliance with the Contract Documents. At the District's discretion, District may elect to deduct laboratory or other testing costs for noncompliant materials from the Contract Price, and such deduction shall not constitute a withholding.

## **5.3 Costs for After Hours and/or Off Site Inspections**

If the Contractor performs Work outside the Inspector's regular working hours or requests the Inspector to perform inspections off Site, costs of any inspections required outside regular working hours or off Site shall be borne by the Contractor and may be invoiced to the Contractor by the District or the District may deduct those expenses from the next Progress Payment.

## **6. CONTRACTOR**

Contractor shall construct and complete, in a good and workmanlike manner, the Work for the Contract Price including any adjustment(s) to the Contract Price pursuant to provisions



herein regarding changes to the Contract Price. Except as otherwise noted, Contractor shall provide and pay for all labor, materials, equipment, permits (excluding DSA), fees, licenses, facilities, transportation, taxes, bonds and insurance, and services necessary for the proper execution and completion of the Work, except as indicated herein.

## **6.1 Status of Contractor**

**6.1.1** Contractor is and shall at all times be deemed to be an independent contractor and shall be wholly responsible for the manner in which it and its Subcontractors perform the services required of it by the Contract Documents. Nothing herein contained shall be construed as creating the relationship of employer and employee, or principal and agent, between the District, or any of the District's employees or agents, and Contractor or any of Contractor's Subcontractors, agents or employees. Contractor assumes exclusively the responsibility for the acts of its agents, and employees as they relate to the services to be provided during the course and scope of their employment. Contractor, its Subcontractors, agents, and its employees shall not be entitled to any rights or privileges of District employees. District shall be permitted to monitor the Contractor's activities to determine compliance with the terms of this Contract.

**6.1.2** As required by law, Contractor and all Subcontractors shall be properly licensed and regulated by the Contractors State License Board, 9821 Business Park Drive, Sacramento, California 95827, <http://www.cslb.ca.gov>.

**6.1.3** As required by law, Contractor and all Subcontractors shall be properly registered as public works contractors by the Department of Industrial Relations at:  
<https://efiling.dir.ca.gov/PWCR/ActionServlet?action=displayPWCRRegistrationForm> or current URL.

**6.1.4** Contractor represents that it has no existing interest and will not acquire any interest, direct or indirect, which could conflict in any manner or degree with the performance of Work required under this Contract and that no person having any such interest shall be employed by Contractor.

## **6.2 Project Inspection Card(s)**

Contractor shall verify that forms DSA 152 (or the current version applicable at the time the Work is performed) are issued for the Project prior to the commencement of construction.

## **6.3 Contractor's Supervision**

**6.3.1** During progress of the Work, Contractor shall keep on the Premises, and at all other locations where any Work related to the Contract is being performed, an experienced and competent project manager and construction superintendent who are employees of the Contractor, to whom the District does not object and at least one of whom shall be fluent in English, written and verbal.

**6.3.2** The project manager and construction superintendent shall both speak fluently the predominant language of the Contractor's employees.

**6.3.3** Before commencing the Work herein, Contractor shall give written notice to District of the name of its project manager and construction superintendent. Neither the Contractor's project manager nor construction superintendent shall be changed except with prior written notice to District. If the Contractor's project manager and/or construction superintendent proves to be unsatisfactory to Contractor, or to District, any of the District's employees, agents, the Construction Manager, or the Architect, Contractor shall notify District in writing before any change occurs, but no less than two (2) business days prior. Any replacement of the project manager and/or construction superintendent shall be made promptly and must be satisfactory to the District. The Contractor's project manager and construction superintendent shall each represent Contractor, and all directions given to Contractor's project manager and/or construction superintendent shall be as binding as if given to Contractor.

**6.3.4** Contractor shall give efficient supervision to Work, using its best skill and attention. Contractor shall carefully study and compare all Contract Documents, Drawings, Specifications, and other instructions and shall at once report to District, Construction Manager, and Architect any error, inconsistency, or omission that Contractor or its employees and Subcontractors may discover, in writing, with a copy to District's Project Inspector(s). The Contractor shall have responsibility for discovery of errors, inconsistencies, or omissions.

#### **6.4 Duty to Provide Fit Workers**

**6.4.1** Contractor and Subcontractor(s) shall at all times enforce strict discipline and good order among their employees and shall not employ or work any unfit person or anyone not skilled in work assigned to that person. It shall be the responsibility of Contractor to ensure compliance with this requirement. District may require Contractor to permanently remove unfit persons from Project Site.

**6.4.2** Any person in the employ of Contractor or Subcontractor(s) whom District may deem incompetent or unfit shall be excluded from working on the Project and shall not again be employed on the Project except with the prior written consent of District.

**6.4.3** The Contractor shall furnish labor that can work in harmony with all other elements of labor employed or to be employed in the Work.

**6.4.4** If Contractor intends to make any change in the name or legal nature of the Contractor's entity, Contractor must first notify the District in writing prior to making any contemplated change. The District shall determine in writing if Contractor's intended change is permissible while performing this Contract.

#### **6.5 Field Office**

**6.5.1** Contractor shall provide a temporary office on the Work Site for the District's use exclusively, during the term of the Contract.

## **6.6 Purchase of Materials and Equipment**

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays.

## **6.7 Documents on Work**

**6.7.1** Contractor shall at all times keep on the Work Site, or at another location as the District may authorize in writing, one legible copy of all Contract Documents, including Addenda and Change Orders, and Titles 19 and 24 of the California Code of Regulations, the specified edition(s) of the Uniform Building Code, all approved Drawings, Plans, Schedules, and Specifications, and all codes and documents referred to in the Specifications, and made part thereof. These documents shall be kept in good order and available to District, Construction Manager, Architect, Architect's representatives, the Project Inspector(s), and all authorities having jurisdiction. Contractor shall be acquainted with and comply with the provisions of these titles as they relate to this Project. (See particularly the duties of Contractor, Title 24, Part 1, California Code of Regulations, section 4-343.) Contractor shall also be acquainted with and comply with all California Code of Regulations provisions relating to conditions on this Project, particularly Titles 8 and 17. Contractor shall coordinate with Architect and Construction Manager and shall submit its verified report(s) according to the requirements of Title 24.

### **6.7.2 Daily Job Reports.**

**6.7.2.1** Contractor shall maintain, at a minimum, at least one (1) set of Daily Job Reports on the Project. These must be prepared by the Contractor's employee(s) who are present on Site, and must include, at a minimum, the following information:

- 6.7.2.1.1** A brief description of all Work performed on that day.
- 6.7.2.1.2** A summary of all other pertinent events and/or occurrences on that day.
- 6.7.2.1.3** The weather conditions on that day.
- 6.7.2.1.4** A list of all Subcontractor(s) working on that day, including DIR registration numbers.
- 6.7.2.1.5** A list of each Contractor employee working on that day and the total hours worked for each employee.
- 6.7.2.1.6** A complete list of all equipment on Site that day, whether in use or not.
- 6.7.2.1.7** A complete list of all materials, supplies, and equipment delivered on that day.
- 6.7.2.1.8** A complete list of all inspections and tests performed on that day.

**6.7.2.2** Each day Contractor shall provide a copy of the previous day's Daily Job Report to the District or the Construction Manager.

## **6.8 Preservation of Records**

Contractor shall maintain, and District shall have the right to inspect, Contractor's financial records for the Project, including, without limitation, Job Cost Reports for the

Project in compliance with the criteria set forth herein. The District shall have the right to examine and audit all Daily Job Reports or other Project records of Contractor's project manager(s), project superintendent(s), and/or project foreperson(s), all certified payroll records and/or related documents including, without limitation, Job Cost Reports, payroll, payment, timekeeping and tracking documents; all books, estimates, records, contracts, documents, bid documents, bid cost data, subcontract job cost reports, and other data of the Contractor, any Subcontractor, and/or supplier, including computations and projections related to bidding, negotiating, pricing, or performing the Work or Contract modification, in order to evaluate the accuracy, completeness, and currency of the cost, manpower, coordination, supervision, or pricing data at no additional cost to the District. These documents may be duplicative and/or be in addition to any Bid Documents held in escrow by the District. The Contractor shall make available at its office at all reasonable times the materials described in this paragraph for the examination, audit, or reproduction until three (3) years after final payment under this Contract. Notwithstanding the provisions above, Contractor shall provide any records requested by any governmental agency, if available, after the time set forth above.

## **6.9 Integration of Work**

**6.9.1** Contractor shall do all cutting, fitting, patching, and preparation of Work as required to make its several parts come together properly, to fit it to receive or be received by work of other contractors, and to coordinate tolerances to various pieces of work, showing upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and shall conform them as District and/or Architect may direct.

**6.9.2** Contractor shall make its own layout of lines and elevations and shall be responsible for the accuracy of both Contractor's and Subcontractors' work resulting therefrom.

**6.9.3** Contractor and all Subcontractors shall take all field dimensions required in performance of the Work, and shall verify all dimensions and conditions on the Site. All dimensions affecting proper fabrication and installation of all Work must be verified prior to fabrication by taking field measurements of the true conditions. If there are any discrepancies between dimensions in drawings and existing conditions which will affect the Work, Contractor shall bring such discrepancies to the attention of the District and Architect for adjustment before proceeding with the Work. In doing so, it is recognized that Contractor is not acting in the capacity of a licensed design professional, and that Contractor's examination is made in good faith to facilitate construction and does not create an affirmative responsibility to detect errors, omissions or inconsistencies in the Contract Documents or to ascertain compliance with applicable laws, building codes or regulations. Following receipt of written notice from Contractor, the District and/or Architect shall inform Contractor what action, if any, Contractor shall take with regard to such discrepancies.

**6.9.4** All costs caused by noncompliant, defective, or delayed Work shall be borne by Contractor, inclusive of repair work.

**6.9.5** Contractor shall not endanger any work performed by it or anyone else by cutting, excavating, or otherwise altering work and shall not cut or alter work of any other contractor except with consent of District.

## **6.10      Notifications**

**6.10.1** Contractor shall notify the Architect and Project Inspector, in writing, of the commencement of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or the most current version applicable at the time the Work is performed) to the Project Inspector. Forms are available on the DSA's website at: <http://www.dgs.ca.gov/dsa/Forms.aspx>.

**6.10.2** Contractor shall notify the Architect and Project Inspector, in writing, of the completion of construction of each and every aspect of the Work at least 48 hours in advance by submitting form DSA 156 (or current version) to the Project Inspector.

## **6.11      Obtaining of Permits, Licenses and Registrations**

Contractor shall secure and pay for all permits (except DSA), licenses, registrations, approvals and certificates necessary for prosecution of Work, including but not limited to those listed in the Special Conditions, if any, before the date of the commencement of the Work or before the permits, licenses, registrations, approvals and certificates are legally required to continue the Work without interruption. The Contractor shall obtain and pay, only when legally required, for all licenses, registrations, approvals, permits, inspections, and inspection certificates required to be obtained from or issued by any authority having jurisdiction over any part of the Work included in the Contract. All final permits, licenses, registrations, approvals and certificates shall be delivered to District before demand is made for final payment.

## **6.12      Royalties and Patents**

**6.12.1** Contractor shall obtain and pay, only when legally required, all royalties and license fees necessary for prosecution of Work before the earlier of the date of the commencement of the Work or the date that the license is legally required to continue the Work without interruption. Contractor shall defend suits or claims of infringement of patent, copyright, or other rights and shall hold the District, the Architect, and the Construction Manager harmless and indemnify them from loss on account thereof except when a particular design, process, or make or model of product is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process, or product is an infringement of a patent or copyright, the Contractor shall indemnify and defend the District, Architect and Construction Manager against any loss or damage unless the Contractor promptly informs the District of its information.

**6.12.2** The review by the District or Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be only its adequacy for the Work and shall not approve use by the Contractor in violation of any patent or other rights of any person or entity.

## **6.13      Work to Comply With Applicable Laws and Regulations**

**6.13.1** Contractor shall give all notices and comply with the following specific laws, ordinances, rules, and regulations and all other applicable laws, ordinances, rules, and regulations bearing on conduct of Work as indicated and specified, including but not limited to the appropriate statutes and administrative code sections. If Contractor observes that Drawings and Specifications are at variance

therewith, or should Contractor become aware of the development of conditions not covered by Contract Documents that may result in finished Work being at variance therewith, Contractor shall promptly notify District in writing and any changes deemed necessary by District shall be made as provided in Contract for changes in Work.

**6.13.1.1** National Electrical Safety Code, U. S. Department of Commerce

**6.13.1.2** National Board of Fire Underwriters' Regulations

**6.13.1.3** International Building Code, latest addition, and the California Code of Regulations, title 24, and other amendments

**6.13.1.4** Manual of Accident Prevention in Construction, latest edition, published by A.G.C. of America

**6.13.1.5** Industrial Accident Commission's Safety Orders, State of California

**6.13.1.6** Regulations of the State Fire Marshall (title 19, California Code of Regulations) and Pertinent Local Fire Safety Codes

**6.13.1.7** Americans with Disabilities Act

**6.13.1.8** Education Code of the State of California

**6.13.1.9** Government Code of the State of California

**6.13.1.10** Labor Code of the State of California, division 2, part 7, Public Works and Public Agencies

**6.13.1.11** Public Contract Code of the State of California

**6.13.1.12** California Art Preservation Act

**6.13.1.13** U. S. Copyright Act

**6.13.1.14** U. S. Visual Artists Rights Act

**6.13.2** Contractor shall comply with all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act (Public Resources Code section 21000 et seq.).

**6.13.3** If Contractor performs any Work that it knew, or through exercise of reasonable care should have known, to be contrary to any applicable laws, ordinance, rules, or regulations, Contractor shall bear all costs arising therefrom and arising from the correction of said Work.

**6.13.4** Where Specifications or Drawings state that materials, processes, or procedures must be approved by the DSA, State Fire Marshall, or other body or agency, Contractor shall be responsible for satisfying requirements of such bodies or agencies applicable at the time the Work is performed, and as determined by those bodies or agencies.

#### **6.14      Safety/Protection of Persons and Property**

**6.14.1**      The Contractor will be solely and completely responsible for conditions of the Work Site, including safety of all persons and property during performance of the Work. This requirement will apply continuously and not be limited to normal working hours.

**6.14.2**      The wearing of hard hats will be mandatory at all times for all personnel on Site. Contractor shall supply sufficient hard hats to properly equip all employees and visitors.

**6.14.3**      Any construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the Work Site.

**6.14.4**      Implementation and maintenance of safety programs shall be the sole responsibility of the Contractor.

**6.14.5**      The Contractor shall furnish to the District a copy of the Contractor's safety plan within the time frame indicated in the Contract Documents and specifically adapted for the Project.

**6.14.6**      Contractor shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of this Contract and shall take all necessary measures and be responsible for the proper care and completion and final acceptance by District. All Work shall be solely at Contractor's risk with the exception of damage to the Work caused by "acts of God" as defined in Public Contract Code section 7105.

**6.14.7**      Contractor shall take, and require Subcontractors to take, all necessary precautions for safety of workers on the Project and shall comply with all applicable federal, state, local, and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. Contractor shall furnish, erect, and properly maintain at all times, all necessary safety devices, safeguards, construction canopies, signs, nets, barriers, lights, and watchmen for protection of workers and the public and shall post danger signs warning against hazards created by such features in the course of construction.

**6.14.8**      Hazards Control – Contractor shall store volatile wastes in covered metal containers and remove them from the Site daily. Contractor shall prevent accumulation of wastes that create hazardous conditions. Contractor shall provide adequate ventilation during use of volatile or noxious substances.

**6.14.9**      Contractor shall designate a responsible member of its organization on the Project, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety, and health of workers. Name and position of person so designated shall be reported to District by Contractor.

**6.14.10** Contractor shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, Contractor shall correct such violation promptly.

**6.14.11** Contractor shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

**6.14.12** In an emergency affecting safety of life or of work or of adjoining property, Contractor, without special instruction or authorization, shall act, at its discretion, to prevent such threatened loss or injury. Any compensation claimed by Contractor on account of emergency work shall be determined by agreement.

**6.14.13** All salvage materials will become the property of the Contractor and shall be removed from the Site unless otherwise called for in the Contract Documents. However, the District reserves the right to designate certain items of value that shall be turned over to the District unless otherwise directed by District.

**6.14.14** All connections to public utilities and/or existing on-site services shall be made and maintained in such a manner as to not interfere with the continuing use of same by the District during the entire progress of the Work.

**6.14.15** Contractor shall provide such heat, covering, and enclosures as are necessary to protect all Work, materials, equipment, appliances, and tools against damage by weather conditions, such as extreme heat, cold, rain, snow, dry winds, flooding, or dampness.

**6.14.16** The Contractor shall protect and preserve the Work from all damage or accident, providing any temporary roofs, window and door coverings, boxings, or other construction as required by the Architect. The Contractor shall be responsible for existing structures, walks, roads, trees, landscaping, and/or improvements in working areas; and shall provide adequate protection therefore. If temporary removal is necessary of any of the above items, or damage occurs due to the Work, the Contractor shall replace same at his expense with same kind, quality, and size of Work or item damaged. This shall include any adjoining property of the District and others.

**6.14.17** Contractor shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property, and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations.

**6.14.18** Contractor shall confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits, or directions of Architect, and shall not interfere with the Work or unreasonably encumber Premises or overload any structure with materials. Contractor shall enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking, and require that all workers comply with all regulations while on Project Site.



**6.14.19** Contractor, Contractor's employees, Subcontractors, Subcontractors' employees, or any person associated with the Work shall conduct themselves in a manner appropriate for a school site. No verbal or physical contact with neighbors, students, and faculty, profanity, or inappropriate attire or behavior will be permitted. District may require Contractor to permanently remove non-complying persons from Project Site.

**6.14.20** Contractor shall take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such markers are disturbed, Contractor shall have a civil engineer, registered as a professional engineer in California, replace them at no cost to District.

**6.14.21** In the event that the Contractor enters into any agreement with owners of any adjacent property to enter upon the adjacent property for the purpose of performing the Work, Contractor shall fully indemnify, defend, and hold harmless each person, entity, firm, or agency that owns or has any interest in adjacent property. The form and content of the agreement of indemnification shall be approved by the District prior to the commencement of any Work on or about the adjacent property. The Contractor shall also indemnify the District as provided in the indemnification provision herein. These provisions shall be in addition to any other requirements of the owners of the adjacent property.

## **6.15      Working Evenings and Weekends**

Contractor may be required to work increased hours, evenings, and/or weekends at no additional cost to the District. Contractor shall give the District seventy-two (72) hours' notice prior to performing any evening and/or weekend work. Contractor shall perform all evening and/or weekend work only upon District's approval and in compliance with all applicable rules, regulations, laws, and local ordinances including, without limitation, all noise and light limitations. Contractor shall reimburse the District for any increased or additional Inspector charges as a result of Contractor's increased hours, or evening and/or weekend work.

## **6.16      Cleaning Up**

**6.16.1** The Contractor shall provide all services, labor, materials, and equipment necessary for protecting and securing the Work, all school occupants, furnishings, equipment, and building structure from damage until its completion and final acceptance by District. Dust barriers shall be provided to isolate dust and dirt from construction operations. At completion of the Work and portions thereof, Contractor shall clean to the original state any areas beyond the Work area that become dust laden as a result of the Work. The Contractor must erect the necessary warning signs and barricades to ensure the safety of all school occupants. The Contractor at all times must maintain good housekeeping practices to reduce the risk of fire damage and must make a fire extinguisher, fire blanket, and/or fire watch, as applicable, available at each location where cutting, braising, soldering, and/or welding is being performed or where there is an increased risk of fire.

**6.16.2** Contractor at all times shall keep Premises, including property immediately adjacent thereto, free from debris such as waste, rubbish (including personal rubbish of workers, e.g., food wrappers, etc.), and excess materials and equipment caused by the Work. Contractor shall not leave debris under, in, or

about the Premises (or surrounding property or neighborhood), but shall promptly remove same from the Premises on a daily basis. If Contractor fails to clean up, District may do so and the cost thereof shall be charged to Contractor. If Contract is for work on an existing facility, Contractor shall also perform specific clean-up on or about the Premises upon request by the District as it deems necessary for the continuing education process. Contractor shall comply with all related provisions of the Specifications.

**6.16.3** If the Construction Manager, Architect, or District observes the accumulation of trash and debris, the District will give the Contractor a 24-hour written notice to mitigate the condition.

**6.16.4** Should the Contractor fail to perform the required clean-up, or should the clean-up be deemed unsatisfactory by the District, the District will then perform the clean-up. All cost associated with the clean-up work (including all travel, payroll burden, and costs for supervision) will be deducted from the Contract Price, or District may withhold those amounts from payment(s) to Contractor.

## **7. SUBCONTRACTORS**

**7.1** Contractor shall provide the District with information for all Subcontracts as indicated in the Contractor's Submittals and Schedules Section herein.

**7.2** No contractual relationship exists between the District and any Subcontractor, supplier, or sub-subcontractor by reason of this Contract.

**7.3** Contractor agrees to bind every Subcontractor by terms of this Contract as far as those terms that are applicable to Subcontractor's work including, without limitation, all labor, wage & hour, apprentice and related provisions and requirements. If Contractor shall subcontract any part of this Contract, Contractor shall be as fully responsible to District for acts and omissions of any Subcontractor and of persons either directly or indirectly employed by any Subcontractor, including Subcontractor caused Project delays, as it is for acts and omissions of persons directly employed by Contractor. The divisions or sections of the Specifications and/or the arrangement of the drawings are not intended to control the Contractor in dividing the Work among Subcontractors or limit the work performed by any trade.

**7.4** District's consent to, or approval of, or failure to object to, any Subcontractor under this Contract shall not in any way relieve Contractor of any obligations under this Contract and no such consent shall be deemed to waive any provisions of this Contract.

**7.5** Contractor is directed to familiarize itself with sections 4100 through 4114 of the Public Contract Code of the State of California, as regards subletting and subcontracting, and to comply with all applicable requirements therein. In addition, Contractor is directed to familiarize itself with sections 1720 through 1861 of the Labor Code of the State of California, as regards the payment of prevailing wages and related issues, and to comply with all applicable requirements therein including, without limitation, section 1775 and the Contractor's and Subcontractors' obligations and liability for violations of prevailing wage law and other applicable laws.

**7.6** No Contractor whose Bid is accepted shall, without consent of the awarding authority and in full compliance with section 4100 et seq. of the Public Contract Code,

including, without limitation, sections 4107, 4107.5, and 4109 of the Public Contract Code, and section 1771.1 of the Labor Code, either:

**7.6.1** Substitute any person as a Subcontractor in place of the Subcontractor designated in the original Bid; or

**7.6.2** Permit any Subcontract to be assigned or transferred, or allow any portion of the Work to be performed by anyone other than the original Subcontractor listed in the Bid; or

**7.6.3** Sublet or subcontract any portion of the Work in excess of one-half of one percent (0.5%) of the Contractor's total bid as to which his original bid did not designate a Subcontractor.

**7.7** The Contractor shall be responsible for the coordination of the trades, Subcontractors, sub-subcontractors, and material or equipment suppliers working on the Project.

**7.7.1** If the Contract is valued at \$1 million or more and uses, or plans to use, state bond funds, then Contractor is responsible for ensuring that first tier Subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43, and/or C-46 licenses are prequalified by the District to work on the Project pursuant to Public Contract Code section 20111.6.

**7.7.2** Contractor is responsible for ensuring that all Subcontractors are properly registered as public works contractors by the Department of Industrial Relations.

**7.8** Contractor is solely responsible for settling any differences between the Contractor and its Subcontractor(s) or between Subcontractors.

**7.9** Contractor must include in all of its subcontracts the assignment provisions as indicated in the Termination section of these General Conditions.

## **8. OTHER CONTRACTS/CONTRACTORS**

**8.1** District reserves the right to let other contracts, and/or to perform work with its own forces, in connection with the Project. Contractor shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly coordinate and connect Contractor's Work with the work of other contractors.

**8.2** In addition to Contractor's obligation to protect its own Work, Contractor shall protect the work of any other contractor that Contractor encounters while working on the Project.

**8.3** If any part of Contractor's Work depends for proper execution or results upon work of District or any other contractor, the Contractor shall inspect and, before proceeding with its Work, promptly report to the District in writing any defects in District's or any other contractor's work that render Contractor's Work unsuitable for proper execution and results. Contractor shall be held accountable for damages to District for District's or any other contractor's work that Contractor failed to inspect or should have inspected. Contractor's failure to inspect and report shall constitute

Contractor's acceptance of all District's or any other contractor's work as fit and proper for reception of Contractor's Work, except as to defects that may develop in District's or any other contractor's work after execution of Contractor's Work and not caused by execution of Contractor's Work.

**8.4** To ensure proper execution of its subsequent work, Contractor shall measure and inspect work already in place and shall at once report to the District in writing any discrepancy between that executed work and the Contract Documents.

**8.5** Contractor shall ascertain to its own satisfaction the scope of the Project and nature of District's or any other contracts that have been or may be awarded by District in prosecution of the Project to the end that Contractor may perform this Contract in light of the other contracts, if any.

**8.6** Nothing herein contained shall be interpreted as granting to Contractor exclusive occupancy of the Site, the Premises, or of the Project. Contractor shall not cause any unnecessary hindrance or delay to the use and/or school operation(s) of the Premises and/or to District or any other contractor working on the Project. If simultaneous execution of any contract or school operation is likely to cause interference with performance of Contractor's Contract, Contractor shall coordinate with those contractor(s), person(s), and/or entity(s) and shall notify the District of the resolution.

## **9. DRAWINGS AND SPECIFICATIONS**

**9.1** A complete list of all Drawings that form a part of the Contract is to be found as an index on the Drawings themselves, and/or may be provided to the Contractor and/or in the Table of Contents.

**9.2** Materials or Work described in words that so applied have a well-known technical or trade meaning shall be deemed to refer to recognized standards, unless noted otherwise.

**9.3 Trade Name or Trade Term.** It is not the intention of this Contract to go into detailed descriptions of any materials and/or methods commonly known to the trade under "trade name" or "trade term." The mere mention or notation of "trade name" or "trade term" shall be considered a sufficient notice to Contractor that it will be required to complete the work so named, complete, finished, and operable, with all its appurtenances, according to the best practices of the trade.

**9.4** The naming of any material and/or equipment shall mean furnishing and installing of same, including all incidental and accessory items thereto and/or labor therefor, as per best practices of the trade(s) involved, unless specifically noted otherwise.

**9.5** Contract Documents are complementary, and what is called for by one shall be binding as if called for by all. As such, Drawings and Specifications are intended to be fully cooperative and to agree. However, if Contractor observes that Drawings and Specifications are in conflict with the Contract Documents, Contractor shall promptly notify District and Architect in writing, and any necessary changes shall be made as provided in the Contract Documents.

**9.6** In the case of discrepancy or ambiguity in the Contract Documents, the order of precedence in the Agreement shall prevail. However, in the case of discrepancy or

ambiguity solely between and among the Drawings and Specifications, the discrepancy or ambiguity shall be resolved in favor of the interpretation that will provide District with the functionally complete and operable Project described in the Drawings and Specifications. In case of ambiguity, conflict, or lack of information, District will furnish clarifications with reasonable promptness.

**9.7** Drawings and Specifications are intended to comply with all laws, ordinances, rules, and regulations of constituted authorities having jurisdiction, and where referred to in the Contract Documents, the laws, ordinances, rules, and regulations shall be considered as a part of the Contract within the limits specified. Contractor shall bear all expense of correcting work done contrary to said laws, ordinances, rules, and regulations.

**9.8** As required by Section 4-317(c), Part 1, Title 24, CCR: "Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA-approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work."

#### **9.9 Ownership of Drawings**

All copies of Plans, Drawings, Designs, Specifications, and copies of other incidental architectural and engineering work, or copies of other Contract Documents furnished by District, are the property of District. They are not to be used by Contractor in other work and, with the exception of signed sets of Contract Documents, are to be returned to District on request at completion of Work, or may be used by District as it may require without any additional costs to District. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. District hereby grants the Contractor, Subcontractors, sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings prepared for the Project in the execution of their Work under the Contract Documents.

### **10. CONTRACTOR'S SUBMITTALS AND SCHEDULES**

Contractor's submittals shall comply with the provisions and requirements of the Specifications including, without limitation Submittals.

#### **10.1 Schedule of Work, Schedule of Submittals, and Schedule of Values**

**10.1.1** Within **TEN (10)** calendar days after the date of the Notice to Proceed (unless otherwise specified in the Specifications), the Contractor shall prepare and submit to the District for review, in a form supported by sufficient data to substantiate its accuracy as the District may require:

**10.1.1.1** Preliminary Schedule. A preliminary schedule of construction indicating the starting and completion dates of the various stages of the Work, including any information and following any form as may be specified in the Specifications. Once approved by District, this shall become the Construction Schedule. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of

each critical path task as well as all Contract milestones and each milestone's completion date(s) as may be required by the District.

**10.1.1.1.1** The District is not required to approve a preliminary schedule of construction with early completion, i.e., one that shows early completion dates for the Work and/or milestones. Contractor shall not be entitled to extra compensation if the District approves a Construction Schedule with an early completion date and Contractor completes the Project beyond the date shown in the schedule but within the Contract Time. A Construction Schedule showing the Work completed in less than the Contract Time, the time between the early completion date and the end of the Contract Time shall be Float.

**10.1.1.2** Preliminary Schedule of Values. A preliminary schedule of values for all of the Work, which must include quantities and prices of items aggregating the Contract Price and must subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Unless the Special Conditions contain different limits, this preliminary schedule of values shall include, at a minimum, the following information and the following structure:

**10.1.1.2.1** Divided into at least the following categories:

- 10.1.1.2.1.1** Overhead and profit;
- 10.1.1.2.1.2** Supervision;
- 10.1.1.2.1.3** General conditions;
- 10.1.1.2.1.4** Layout;
- 10.1.1.2.1.5** Mobilization;
- 10.1.1.2.1.6** Submittals;
- 10.1.1.2.1.7** Bonds and insurance;
- 10.1.1.2.1.8** Close-out/Certification documentation;
- 10.1.1.2.1.9** Demolition;
- 10.1.1.2.1.10** Installation;
- 10.1.1.2.1.11** Rough-in;
- 10.1.1.2.1.12** Finishes;
- 10.1.1.2.1.13** Testing;
- 10.1.1.2.1.14** Punchlist and District acceptance.

**10.1.1.2.2** And also divided by each of the following areas:

- 10.1.1.2.2.1** Site work;
- 10.1.1.2.2.2** By each building;
- 10.1.1.2.2.3** By each floor.

**10.1.1.2.3** The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

- 10.1.1.2.3.1** Mobilization and layout combined to equal not more than 1%;
- 10.1.1.2.3.2** Submittals, samples and shop drawings combined to equal not more than 3%;
- 10.1.1.2.3.3** Bonds and insurance combined to equal not more than 2%.

**10.1.1.2.4** Closeout documentation shall have a value in the preliminary schedule of not less than 5%.

**10.1.1.2.5** Notwithstanding any provision of the Contract Documents to the contrary, payment of the Contractor's overhead, supervision, general conditions costs, and profit, as reflected in the Cost Breakdown, shall be paid based on percentage complete, with the disbursement of Progress Payments and the Final Payment.

**10.1.1.2.6** Contractor shall certify that the preliminary schedule of values as submitted to the District is accurate and reflects the costs as developed in preparing Contractor's bid. For example, without limiting the foregoing, Contractor shall not "front-load" the preliminary schedule of values with dollar amounts greater than the value of activities performed early in the Project.

**10.1.1.2.7** The preliminary schedule of values shall be subject to the District's review and approval of the form and content thereof. In the event that the District objects to any portion of the preliminary schedule of values, the District shall notify the Contractor, in writing, of the District's objection(s) to the preliminary schedule of values. Within five (5) calendar days of the date of the District's written objection(s), Contractor shall submit a revised preliminary schedule of values to the District for review and approval. The foregoing procedure for the preparation, review and approval of the preliminary schedule of values shall continue until the District has approved the entirety of the preliminary schedule of values.

**10.1.1.2.8** Once the preliminary schedule of values is approved by the District, this shall become the Schedule of Values. The Schedule of Values shall not be thereafter modified or amended by the Contractor without the prior consent and approval of the District, which may be granted or withheld in the sole discretion of the District.

**10.1.1.3 Preliminary Schedule of Submittals.** A preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals. Once approved by District, this shall become the Submittal Schedule. All submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those submittals shall be forwarded to the District so as not to delay the Construction Schedule. Upon request by the District, Contractor shall provide an electronic copy of all submittals to the District. All submittals shall be submitted no later than 90 days after the Notice to Proceed.

**10.1.1.4 Safety Plan.** Contractor's Safety Plan specifically adapted for the Project. Contractor's Safety Plan shall comply with the following requirements:

**10.1.1.4.1** All applicable requirements of California Division of Occupational Safety and Health ("CalOSHA") and/or of the United States Occupational Safety and Health Administration ("OSHA").

**10.1.1.4.2** All provisions regarding Project safety, including all applicable provisions in these General Conditions.

**10.1.1.4.3** Contractor's Safety Plan shall be in English and in the language(s) of the Contractor's and its Subcontractors' employees.

**10.1.1.5 Complete Registered Subcontractors List.** The name, address, telephone number, facsimile number, California State Contractors License number, classification, DIR registration number and monetary value of all Subcontracts of any tier for parties furnishing labor, material, or equipment for completion of the Project.

**10.1.2** Contractor must provide all schedules both in hard copy and electronically, in a format (e.g., Microsoft Project or Primavera) approved in advance by the District.

**10.1.3** The District will review the schedules submitted and the Contractor shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

**10.1.4** The District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.

**10.1.5** All submittals and schedules must be approved by the District before Contractor can rely on them as a basis for payment.

## **10.2 Monthly Progress Schedule(s)**

**10.2.1** Contractor shall provide Monthly Progress Schedule(s) to the District. A Monthly Progress Schedule shall update the approved Construction Schedule or the last Monthly Progress Schedule, showing all work completed and to be completed as well as updating the Registered Subcontractors List. The monthly Progress Schedule shall be sent within the timeframe requested by the District and shall be in a format acceptable to the District and contain a written narrative of the progress of work that month and any changes, delays, or events that may affect the work. The process for District approval of the Monthly Progress Schedule shall be the same as the process for approval of the Construction Schedule.

**10.2.2** Contractor shall submit Monthly Progress Schedule(s) with all payment applications.

**10.2.3** Contractor must provide all schedules both in hard copy and electronically, in a format (e.g., Microsoft Project or Primavera) approved in advance by the District.

**10.2.4** The District will review the schedules submitted and the Contractor shall make changes and corrections in the schedules as requested by the District and resubmit the schedules until approved by the District.

**10.2.5** The District shall have the right at any time to revise the schedule of values if, in the District's sole opinion, the schedule of values does not accurately reflect the value of the Work performed.



**10.2.6** All submittals and schedules must be approved by the District before Contractor can rely on them as a basis for payment.

### **10.3 Material Safety Data Sheets (MSDS)**

Contractor is required to ensure Material Safety Data Sheets are available in a readily accessible place at the Work Site for any material requiring a Material Safety Data Sheet per the federal "Hazard Communication" standard, or employees' "right to know" law. The Contractor is also required to ensure proper labeling on substances brought onto the job site and that any person working with the material or within the general area of the material is informed of the hazards of the substance and follows proper handling and protection procedures. Two additional copies of the Material Safety Data Sheets shall also be submitted directly to the District.

## **11. SITE ACCESS, CONDITIONS, AND REQUIREMENTS**

### **11.1 Site Investigation**

Before bidding on this Work, Contractor shall make a careful investigation of the Site and thoroughly familiarize itself with the requirements of the Contract. By the act of submitting a bid for the Work included in this Contract, Contractor shall be deemed to have made a complete study and investigation, and to be familiar with and accepted the existing conditions of the Site.

Prior to commencing the Work, Contractor and the District's representative shall survey the Site to document the condition of the Site. Contractor will record the survey in digital videotape format and provide an electronic copy to the District within fourteen (14) days of the survey. This electronic record shall serve as a basis for determining any damages caused by the Contractor during the Project. The Contractor may also document any pre-existing conditions in writing, provided that both the Contractor and the District's representative agree on said conditions and sign a memorandum documenting the same.

### **11.2 Soils Investigation Report**

**11.2.1** When a soils investigation report obtained from test holes at Site or for the Project is available, that report may be available to the Contractor but shall not be a part of this Contract and shall not alleviate or excuse the Contractor's obligation to perform its own investigation. Any information obtained from that report or any information given on Drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only, is not guaranteed, does not form a part of this Contract, and Contractor may not rely thereon. By submitting its bid, Contractor acknowledges that it has made visual examination of Site and has made whatever tests Contractor deems appropriate to determine underground condition of soil.

**11.2.2** Contractor agrees that no claim against District will be made by Contractor for damages and hereby waives any rights to damages if, during progress of Work, Contractor encounters subsurface or latent conditions at Site materially differing from those shown on Drawings or indicated in Specifications, or for unknown conditions of an unusual nature that differ materially from those ordinarily encountered in the work of the character provided for in Plans and

Specifications, except as indicated in the provisions of these General Conditions regarding trenches, trenching, and/or existing utility lines.

### **11.3      Access to Work**

District and its representatives shall at all times have access to Work wherever it is in preparation or progress, including storage and fabrication. Contractor shall provide safe and proper facilities for such access so that District's representatives may perform their functions.

### **11.4      Layout and Field Engineering**

**11.4.1** All field engineering required for layout of this Work and establishing grades for earthwork operations shall be furnished by Contractor at its expense. This Work shall be done by a qualified, California-registered civil engineer approved in writing by District and Architect. Any required Record and/or As-Built Drawings of Site development shall be prepared by the approved civil engineer.

**11.4.2** The Contractor shall be responsible for having ascertained pertinent local conditions such as location, accessibility, and general character of the Site and for having satisfied itself as to the conditions under which the Work is to be performed. Contractor shall follow best practices, including but not limited to potholing to avoid utilities. District shall not be liable for any claim for allowances because of Contractor's error, failure to follow best practices, or negligence in acquainting itself with the conditions at the Site.

**11.4.3** Contractor shall protect and preserve established benchmarks and monuments and shall make no changes in locations without the prior written approval of District. Contractor shall replace any benchmarks or monuments that are lost or destroyed subsequent to proper notification of District and with District's approval.

### **11.5      Utilities**

Utilities shall be provided as indicated in the Specifications.

### **11.6      Sanitary Facilities**

Sanitary facilities shall be provided as indicated in the Specifications.

### **11.7      Surveys**

Contractor shall provide surveys done by a California-licensed civil engineer surveyor to determine locations of construction, grading, and site work as required to perform the Work.

### **11.8      Regional Notification Center**

The Contractor, except in an emergency, shall contact the appropriate regional notification center at least two (2) days prior to commencing any excavation if the excavation will be conducted in an area or in a private easement that is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry

identification number from that notification center. No excavation shall be commenced and/or carried out by the Contractor unless an inquiry identification number has been assigned to the Contractor or any Subcontractor and the Contractor has given the District the identification number. Any damages arising from Contractor's failure to make appropriate notification shall be at the sole risk and expense of the Contractor. Any delays caused by failure to make appropriate notification shall be at the sole risk of the Contractor and shall not be considered for an extension of the Contract Time.

#### **11.9      Existing Utility Lines**

**11.9.1**      Pursuant to Government Code section 4215, District assumes the responsibility for removal, relocation, and protection of main or trunk utility lines and facilities located on the construction Site at the time of commencement of construction under this Contract with respect to any such utility facilities that are not identified in the Plans and Specifications. Contractor shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of District or the owner of a utility to provide for removal or relocation of such utility facilities.

**11.9.2**      Locations of existing utilities provided by District shall not be considered exact, but approximate within a reasonable margin and shall not relieve Contractor of responsibilities to exercise reasonable care or costs of repair due to Contractor's failure to do so. District shall compensate Contractor for the costs of locating, repairing damage not due to the failure of Contractor to exercise reasonable care, and removing or relocating such utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during such work.

**11.9.3**      No provision herein shall be construed to preclude assessment against Contractor for any other delays in completion of the Work. Nothing in this Article shall be deemed to require District to indicate the presence of existing service laterals, appurtenances, or other utility lines, within the exception of main or trunk utility lines or whenever the presence of these utilities on the Site of the construction Project can be inferred from the presence of other visible facilities, such as buildings, meter junction boxes, on or adjacent to the Site of the construction.

**11.9.4**      If Contractor, while performing Work under this Contract, discovers utility facilities not identified by District in Contract Plans and Specifications, Contractor shall immediately notify the District and the utility in writing. The cost of repair for damage to above-mentioned visible facilities without prior written notification to the District shall be borne by the Contractor.

#### **11.10     Notification**

Contractor understands, acknowledges and agrees that the purpose for prompt notification to the District pursuant to these provisions is to allow the District to investigate the condition(s) so that the District shall have the opportunity to decide how the District desires to proceed as a result of the condition(s). Accordingly, failure of Contractor to promptly notify the District in writing, pursuant to these provisions, shall constitute Contractor's waiver of any claim for damages or delay incurred as a result of the condition(s).

### **11.11 Hazardous Materials**

Contractor shall comply with all provisions and requirements of the Contract Documents related to hazardous materials including, without limitation, Hazardous Materials Procedures and Requirements.

### **11.12 No Signs**

Neither the Contractor nor any other person or entity shall display any signs not required by law or the Contract Documents at the Site, fences trailers, offices, or elsewhere on the Site without specific prior written approval of the District.

## **12. TRENCHES**

### **12.1 Trenches Greater Than Five Feet**

Pursuant to Labor Code section 6705, if the Contract Price exceeds \$25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, promptly submit to the District and/or a registered civil or structural engineer employed by the District or Architect, a detailed plan, stamped by a licensed engineer retained by the Contractor, showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

### **12.2 Excavation Safety**

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the District or by the person to whom authority to accept has been delegated by the District.

### **12.3 No Tort Liability of District**

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.

### **12.4 No Excavation without Permits**

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CalOSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

### **12.5 Discovery of Hazardous Waste and/or Unusual Conditions**

**12.5.1** Pursuant to Public Contract Code section 7104, if the Work involves digging trenches or other excavations that extend deeper than four feet below the Surface, the Contractor shall promptly, and before the following conditions are disturbed, notify the District, in writing, of any:

**12.5.1.1** Material that the Contractor believes may be material that is hazardous waste, as defined in section 25117 of the Health and Safety Code, is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

**12.5.1.2** Subsurface or latent physical conditions at the Site differing from those indicated.

**12.5.1.3** Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

**12.5.2** The District shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the Work, shall issue a Change Order under the procedures described herein.

**12.5.3** In the event that a dispute arises between District and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law that pertain to the resolution of disputes and protests.

### **13. INSURANCE AND BONDS**

#### **13.1 Insurance**

Unless different provisions and/or limits are indicated in the Special Conditions, all insurance required of Contractor and/or its Subcontractor(s) shall be in the amounts and include the provisions set forth herein.

##### **13.1.1 Commercial General Liability and Automobile Liability Insurance**

**13.1.1.1** Contractor shall procure and maintain, during the life of this Contract, Commercial General Liability Insurance and Automobile Liability Insurance that shall protect Contractor, District, State, Construction Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, personal injury, death, advertising injury, and medical payments arising from, or in connection with, operations under this Contract. This coverage shall be provided in a form at least as broad as Insurance Services (ISO) Form CG 0001 11188. Contractor shall ensure that Products Liability and Completed Operations coverage, Fire Damage Liability coverage, and Automobile Liability Insurance coverage including owned, non-owned, and hired automobiles, are included within the above policies and at the required limits, or Contractor shall procure and maintain these coverages separately.

**13.1.1.2** Contractor's deductible or self-insured retention for its Commercial General Liability Insurance policy shall not exceed \$25,000 unless approved in writing by District.

**13.1.1.3** All such policies shall be written on an occurrence form.

**13.1.2 Excess Liability Insurance**

**13.1.2.1** If Contractor's underlying policy limits are less than required, subject to 13.1.2.3 below, Contractor may procure and maintain, during the life of this Contract, an Excess Liability Insurance Policy to meet the policy limit requirements of the required policies in order to satisfy, in the aggregate with its underlying policy, the insurance requirements herein..

**13.1.2.2** There shall be no gap between the per occurrence amount of any underlying policy and the start of the coverage under the Excess Liability Insurance Policy. Any Excess Liability Insurance Policy shall be written on a following form and shall protect Contractor, District, State, Construction Manager(s), Project Manager(s), and Architect(s) in amounts and including the provisions as set forth in the Supplementary Conditions (if any) and/or Special Conditions, and that complies with all requirements for Commercial General Liability and Automobile Liability and Employers' Liability Insurance.

**13.1.2.3** The District, in its sole discretion, may accept the Excess Liability Insurance Policy that brings Contractor's primary limits to the minimum requirements herein.

**13.1.3 Subcontractor(s):** Contractor shall require its Subcontractor(s), if any, to procure and maintain Commercial General Liability Insurance, Automobile Liability Insurance, and Excess Liability Insurance (if Subcontractor elects to satisfy, in part the insurance required herein by procuring and maintaining an Excess Liability Insurance Policy) with forms of coverage and limits equal to the amounts required of the Contractor.

**13.1.4 Workers' Compensation and Employers' Liability Insurance**

**13.1.4.1** In accordance with provisions of section 3700 of the California Labor Code, the Contractor and every Subcontractor shall be required to secure the payment of compensation to its employees.

**13.1.4.2** Contractor shall procure and maintain, during the life of this Contract, Workers' Compensation Insurance and Employers' Liability Insurance for all of its employees engaged in work under this Contract, on/or at the Site of the Project. This coverage shall cover, at a minimum, medical and surgical treatment, disability benefits, rehabilitation therapy, and survivors' death benefits. Contractor shall require its Subcontractor(s), if any, to procure and maintain Workers' Compensation Insurance and Employers' Liability Insurance for all employees of Subcontractor(s). Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by Contractor's insurance. If any class of employee or employee engaged in Work under this Contract, on or at the Site of the Project, is not protected under the Workers' Compensation Insurance, Contractor shall provide, or shall cause a Subcontractor to provide, adequate insurance coverage for the protection of any employee(s) not otherwise protected before any of those employee(s) commence work.

**13.1.5 Builder's Risk Insurance: Builder's Risk "All Risk" Insurance**

Contractor shall procure and maintain, during the life of this Contract, Builder's Risk (Course of Construction), or similar first party property coverage acceptable to the District, issued on a replacement cost value basis. The cost shall be consistent with the total replacement cost of all insurable Work of the Project included within the Contract Documents. Coverage is to insure against all risks of accidental physical loss and shall include without limitation the perils of vandalism and/or malicious mischief (both without any limitation regarding vacancy or occupancy), sprinkler leakage, civil authority, theft, sonic disturbance, earthquake, flood, collapse, wind, rain, dust, fire, war, terrorism, lightning, smoke, and rioting. Coverage shall include debris removal, demolition, increased costs due to enforcement of all applicable ordinances and/or laws in the repair and replacement of damaged and undamaged portions of the property, and reasonable costs for the Architect's and engineering services and expenses required as a result of any insured loss upon the Work and Project, including completed Work and Work in progress, to the full insurable value thereof.

### **13.1.6 Pollution Liability Insurance**

**13.1.6.1** Contractor shall procure and maintain Pollution Liability Insurance that shall protect Contractor, District, State, Construction Manager(s), Project Inspector(s), and Architect(s) from all claims for bodily injury, property damage, including natural resource damage, cleanup costs, removal, storage, disposal, and/or use of the pollutant arising from operations under this Contract, and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims. Coverage shall apply to sudden and/or gradual pollution conditions resulting from the escape or release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or gases, natural gas, waste materials, or other irritants, contaminants, or pollutants, including asbestos. This coverage shall be provided in a form at least as broad as Insurance Services Offices, Inc. (ISO) Form CG 2415, or Contractor shall procure and maintain these coverages separately.

**13.1.6.2** Contractor warrants that any retroactive date applicable to coverage under the policy shall predate the effective date of the Contract and that continuous coverage will be maintained or an extended reporting or discovery period will be exercised for a period of three (3) years, beginning from the time that the Work under the Contract is completed.

**13.1.6.3** If Contractor is responsible for removing any pollutants from a site, then Contractor shall ensure that Any Auto, including owned, non-owned, and hired, is included within the above policies and at the required limits, to cover its automobile exposure from transporting the pollutants from the site to an approved disposal site. This coverage shall include the Motor Carrier Act Endorsement, MCS 90.

### **13.1.7 Proof of Insurance and Other Requirements: Endorsements and Certificates**

**13.1.7.1** Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract, until Contractor and its Subcontractor(s) have procured all required insurance and Contractor has delivered in duplicate to the District complete endorsements (or entire insurance

policies) and certificates indicating the required coverages have been obtained, and the District has approved these documents.

**13.1.7.2** Endorsements, certificates, and insurance policies shall include the following:

**13.1.7.2.1** A clause stating the following, or other language acceptable to the District:

"This policy shall not be canceled until written notice to District, Architect, and Construction Manager stating date of the cancellation by the insurance carrier. Date of cancellation may not be less than thirty (30) days after date of mailing notice."

**13.1.7.2.2** Language stating in particular those insured, extent of insurance, location and operation to which insurance applies, expiration date, to whom cancellation and reduction notice will be sent, and length of notice period.

**13.1.7.2.3** All endorsements, certificates and insurance policies shall state that District, its trustees, employees and agents, the State of California, Construction Manager(s), Project Manager(s), Inspector(s) and Architect(s) are named additional insureds under all policies except Workers' Compensation Insurance and Employers' Liability Insurance.

**13.1.7.3** No policy shall be amended, canceled or modified, and the coverage amounts shall not be reduced, until Contractor or Contractor's broker has provided written notice to District, Architect(s), and Construction Manager(s) stating date of the amendment, modification, cancellation or reduction, and a description of the change. Date of amendment, modification, cancellation or reduction may not be less than thirty (30) days after date of mailing notice.

**13.1.7.4** Insurance written on a "claims made" basis shall be retroactive to a date that coincides with or precedes Contractor's commencement of Work, including subsequent policies purchased as renewals or replacements. Said policy is to be renewed by the Contractor and all Subcontractors for a period of five (5) years following completion of the Work or termination of this Agreement. Such insurance must have the same coverage and limits as the policy that was in effect during the term of this Agreement, and will cover the Contractor and all Subcontractors for all claims made.

**13.1.7.5** Contractor's and Subcontractors' insurance policy(s) shall be primary and non-contributory to any insurance or self-insurance maintained by District, its trustees, employees and/or agents, the State of California, Construction Manager(s), Project Manager(s), Inspector(s), and/or Architect(s).

**13.1.7.6** All endorsements shall waive any right to subrogation against any of the named additional insureds.

**13.1.7.7** Unless otherwise stated in the Special Conditions, all of Contractor's insurance shall be with insurance companies with an A.M. Best rating of no less than **A: VII**.



**13.1.7.8** The insurance requirements set forth herein shall in no way limit the Contractor's liability arising out of or relating to the performance of the Work or related activities.

**13.1.7.9** Failure of Contractor and/or its Subcontractor(s) to comply with the insurance requirements herein shall be deemed a material breach of the Contract.

**13.1.8 Insurance Policy Limits**

Unless different limits are indicated in the Special Conditions, the limits of insurance shall not be less than the following amounts:

<b>Commercial General Liability</b>	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	\$2,000,000 per occurrence; \$4,000,000 aggregate
<b>Automobile Liability</b>	Any Auto – Combined Single Limit	\$1,000,000
<b>Workers' Compensation</b>		Statutory limits pursuant to State law
<b>Employers' Liability</b>		\$1,000,000
<b>Builder's Risk (Course of Construction)</b>		Issued for the value and scope of Work indicated herein.
<b>Pollution Liability</b>		\$1,000,000 per claim; \$2,000,000 aggregate

**13.2 Contract Security - Bonds**

**13.2.1** Contractor shall furnish two surety bonds issued by a California admitted surety insurer as follows:

**13.2.1.1** Performance Bond: A bond in an amount at least equal to one hundred percent (100%) of Contract Price as security for faithful performance of this Contract.

**13.2.1.2** Payment Bond: A bond in an amount at least equal to one hundred percent (100%) of the Contract Price as security for payment of persons performing labor and/or furnishing materials in connection with this Contract.

**13.2.2** Cost of bonds shall be included in the Bid and Contract Price.

**13.2.3** All bonds related to this Project shall be in the forms set forth in these Contract Documents and shall comply with all requirements of the Contract Documents, including, without limitation, the bond forms.

## **14. WARRANTY/GUARANTEE/INDEMNITY**

### **14.1 Warranty/Guarantee**

**14.1.1** The Contractor shall obtain and preserve for the benefit of the District, manufacturer's warranties on materials, fixtures, and equipment incorporated into the Work.

**14.1.2** In addition to guarantees required elsewhere, Contractor shall, and hereby does guarantee and warrant all Work furnished on the job against all defects for a period of **ONE (1)** year after the later of the following dates, unless a longer period is provided for in the Contract Documents:

**14.1.2.1** The acceptance by the District's governing board of the Work, subject to these General Conditions, or

**14.1.2.2** The date that commissioning for the Project, if any, was completed.

At the District's sole option, Contractor shall repair or replace any and all of that Work, together with any other Work that may be displaced in so doing, that may prove defective in workmanship and/or materials within a **ONE (1)** year period from date of completion as defined above, unless a longer period is provided for in the Contract Documents, without expense whatsoever to District. In the event of failure of Contractor and/or Surety to commence and pursue with diligence said replacements or repairs within ten (10) days after being notified in writing, Contractor and Surety hereby acknowledge and agree that District is authorized to proceed to have defects repaired and made good at expense of Contractor and/or Surety who hereby agree to pay costs and charges therefore immediately on demand.

**14.1.3** If, in the opinion of District, defective work creates a dangerous condition or requires immediate correction or attention to prevent further loss to District or to prevent interruption of operations of District, District will attempt to give the notice required above. If Contractor or Surety cannot be contacted or neither complies with District's request for correction within a reasonable time as determined by District, District may, notwithstanding the above provision, proceed to make any and all corrections and/or provide attentions the District believes are necessary. The costs of correction or attention shall be charged against Contractor and Surety of the guarantees provided in this Article or elsewhere in this Contract.

**14.1.4** The above provisions do not in any way limit the guarantees on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish to District all appropriate guarantee or warranty certificates as indicated in the Specifications or upon request by District.

**14.1.5** Nothing herein shall limit any other rights or remedies available to District.

## **14.2      Indemnity and Defense**

**14.2.1** To the furthest extent permitted by California law, the Contractor shall indemnify, keep and hold harmless the District, the Architect(s), and the Construction Manager(s), their respective consultants, separate contractors, board members, officers, representatives, , agents, and employees, in both individual and official capacities ("Indemnitees"), against all suits, claims, injury, damages, losses, and expenses ("Claims"), including but not limited to attorney's fees, caused by, arising out of, resulting from, or incidental to, in whole or in part, the performance of the Work under this Contract by the Contractor, its Subcontractors, vendors, or suppliers. However, the Contractor's indemnification and hold harmless obligation shall be reduced by the proportion of the Indemnitees' and/or Architect's liability to the extent the Claim(s) is/are caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees, and/or defects in design furnished by the Architect, as found by a court or arbitrator of competent jurisdiction. This indemnification and hold harmless obligation of the Contractor shall not be construed to negate, abridge, or otherwise reduce any right or obligation of indemnity that would otherwise exist or arise as to any Indemnitee or other person described herein. This indemnification and hold harmless obligation includes, but is not limited to, any failure or alleged failure by Contractor to comply with any provision of law, any failure or alleged failure to timely and properly fulfill all of its obligations under the Contract Documents in strict accordance with their terms, and without limitation, any failure or alleged failure of Contractor's obligations regarding any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the DIR.

**14.2.2** To the furthest extent permitted by California law, Contractor shall also defend Indemnitees, at its own expense, including but not limited to attorneys' fees and costs, against all Claims caused by, arising out of, resulting from, or incidental to, in whole or in part, the performance of the Work under this Contract by the Contractor, its Subcontractors, vendors, or suppliers. However, the Contractor's defense obligation shall be reduced by the proportion of the Indemnitees' and/or Architect's liability to the extent caused by the sole negligence, active negligence, or willful misconduct of the Indemnitees, and/or defects in design furnished by the Architect, as found by a court or arbitrator of competent jurisdiction. The District shall have the right to accept or reject any legal representation that Contractor proposes to defend the Indemnitees. If any Indemnitee provides its own defense due to failure to timely respond to tender of defense, rejection of tender of defense, or conflict of interest of proposed counsel, Contractor shall reimburse such Indemnitee for any expenditures. Contractor's defense obligation shall not be construed to negate, abridge, or otherwise reduce any right or obligation of defense that would otherwise exist as to any Indemnitee or other person described herein. Contractor's defense obligation includes, but is not limited to, any failure or alleged failure by Contractor to comply with any provision of law, any failure or alleged failure to timely and properly fulfill all of its obligations under the Contract Documents in strict accordance with their terms, and without limitation, any failure or alleged failure of Contractor's obligations regarding any stop payment notice actions or liens, including Civil Wage and Penalty Assessments and/or Orders by the DIR. The Contractor shall give prompt notice to the District in the event of any Claim(s).

**14.2.3** Without limitation of the provisions herein, if the Contractor's obligation to indemnify and hold harmless the Indemnitees or its obligation to defend Indemnitees as provided herein shall be determined to be void or unenforceable, in whole or in part, it is the intention of the parties that these circumstances shall not otherwise affect the validity or enforceability of the Contractor's agreement to indemnify, defend, and hold harmless the rest of the Indemnitees, as provided herein. Further, the Contractor shall be and remain fully liable on its agreements and obligations herein to the fullest extent permitted by law.

**14.2.4** Pursuant to Public Contract Code section 9201, the District shall provide timely notification to Contractor of the receipt of any third-party Claim relating to this Contract. The District shall be entitled to recover its reasonable costs incurred in providing said notification.

**14.2.5** In any and all Claims against any of the Indemnitees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the Contractor's indemnification obligation herein shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

**14.2.6** The District may retain so much of the moneys due the Contractor as shall be considered necessary, until disposition of any such Claims or until the District, Architect(s) and Construction Manager(s) have received written agreement from the Contractor that they will unconditionally defend the District, Architect(s) and Construction Manager(s), their respective officers, agents and employees, and pay any damages due by reason of settlement or judgment.

**14.2.7** The Contractor's defense and indemnification obligations hereunder shall survive the completion of Work, the warranty/guarantee period, and the termination of the Contract.

## **15. TIME**

### **15.1 Notice to Proceed**

**15.1.1** District may issue a Notice to Proceed within ninety (90) days from the date of the Notice of Award. Once Contractor has received the Notice to Proceed, Contractor shall complete the Work within the period of time indicated in the Contract Documents.

**15.1.2** In the event that the District desires to postpone issuing the Notice to Proceed beyond ninety (90) days from the date of the Notice of Award, it is expressly understood that with reasonable notice to the Contractor, the District may postpone issuing the Notice to Proceed. It is further expressly understood by Contractor that Contractor shall not be entitled to any claim of additional compensation as a result of the postponement of the issuance of the Notice to Proceed.

**15.1.3** If the Contractor believes that a postponement of issuance of the Notice to Proceed will cause a hardship to Contractor, Contractor may terminate the Contract. Contractor's termination due to a postponement shall be by written

notice to District within ten (10) days after receipt by Contractor of District's notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement. Should Contractor terminate the Contract as a result of a notice of postponement, District shall have the authority to award the Contract to the next lowest responsive responsible bidder.

## **15.2      Computation of Time / Adverse Weather**

**15.2.1**      The Contractor will only be allowed a time extension for Adverse Weather conditions if requested by Contractor in compliance with the time extension request procedures and only if all of the following conditions are met:

**15.2.1.1**    The weather conditions constitute Adverse Weather, as defined herein and further specified in the Special Conditions;

**15.2.1.2**    Contractor can verify that the Adverse Weather caused delays in excess of five (5) hours of the indicated labor required to complete the scheduled tasks of Work on the day affected by the Adverse Weather;

**15.2.1.3**    The Contractor's crew is dismissed as a result of the Adverse Weather;

**15.2.1.4**    Said delay adversely affects the critical path in the Construction Schedule; and

**15.2.1.5**    Exceeds twelve (12) days of delay per year.

**15.2.2**      If the aforementioned conditions are met, a non-compensable day-for-day extension will only be allowed for those days in excess of those indicated in the Special Conditions.

**15.2.3**      The Contractor shall work seven (7) days per week, if necessary, irrespective of inclement weather, to maintain access and the Construction Schedule, and to protect the Work under construction from the effects of Adverse Weather, all at no further cost to the District.

**15.2.4**      The Contract Time has been determined with consideration given to the average climate weather conditions prevailing in the County in which the Project is located.

## **15.3      Hours of Work**

### **15.3.1      Sufficient Forces**

Contractor and Subcontractors shall continuously furnish sufficient and competent work forces with the required levels of familiarity with the Project and skill, training and experience to ensure the prosecution of the Work in accordance with the Construction Schedule.

### **15.3.2      Performance During Working Hours**

Work shall be performed during regular working hours as permitted by the appropriate governmental agency except that in the event of an emergency, or when required to complete the Work in accordance with job progress, Work may be performed outside of regular working hours with the advance written consent of the District and approval of any required governmental agencies.

#### **15.3.3 No Work during State Testing**

Contractor shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State or Federally-required tests. The District or District's Representative will provide Contractor with a schedule of test dates concurrent with the District's issuance of the Notice to Proceed, or as soon as test dates are made available to the District.

### **15.4 Progress and Completion**

#### **15.4.1 Time of the Essence**

Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

#### **15.4.2 No Commencement Without Insurance or Bonds**

The Contractor shall not commence operations on the Project or elsewhere prior to the effective date of insurance and bonds. The date of commencement of the Work shall not be changed by the effective date of such insurance or bonds. If Contractor commences Work without insurance and bonds, all Work is performed at Contractor's peril and shall not be compensable until and unless Contractor secures bonds and insurance pursuant to the terms of the Contract Documents and subject to District claim for damages.

### **15.5 Schedule**

Contractor shall provide to District, Construction Manager, and Architect a schedule in conformance with the Contract Documents and as required in the Notice to Proceed and the Contractor's Submittals and Schedules section of these General Conditions.

### **15.6 Expeditious Completion**

The Contractor shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time.

## **16. EXTENSIONS OF TIME – LIQUIDATED DAMAGES**

### **16.1 Liquidated Damages**

Contractor and District hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the District will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Contractor

shall pay to District as fixed and liquidated damages, and not as a penalty, the amount set forth in the Agreement for each calendar day of delay in completion. Contractor and its Surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

## **16.2      Excusable Delay**

**16.2.1** Contractor shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault of Contractor or its Subcontractors, including acts of God as defined in Public Contract Code section 7105, acts of enemy, epidemics, and quarantine restrictions. Contractor shall, within five (5) calendar days of beginning of any delay, notify District in writing of causes of delay including documentation and facts explaining the delay and the direct correlation between the cause and effect. District shall review the facts and extent of any delay and shall grant extension(s) of time for completing Work when, in its judgment, the findings of fact justify an extension. Extension(s) of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted if Contractor has timely submitted the Construction Schedule as required herein.

**16.2.2** Contractor shall notify the District pursuant to the claims provisions in these General Conditions of any anticipated delay and its cause. Following submission of a claim, the District may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

**16.2.3** In the event the Contractor requests an extension of Contract Time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in Work. When requesting time, requests must be submitted with full justification and documentation. If the Contractor fails to submit justification, it waives its right to a time extension at a later date. Such justification must be based on the official Construction Schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the Scope of Work. Any claim for delay must include the following information as support, without limitation:

**16.2.3.1** The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform the activities within the stated duration.

**16.2.3.2** Specific logical ties to the Contract Schedule for the proposed changes and/or delay showing the activity/activities in the Construction Schedule that are affected by the change and/or delay. In particular, Contractor must show an actual impact to the schedule, after making a good faith effort to mitigate the delay by rescheduling the work, by providing an analysis of the schedule ("Schedule Analysis"). Such Schedule Analysis shall describe in detail the cause and effect of the delay and the impact on the critical dates in the Project schedule. (A portion of any delay of seven (7) days or more must be provided.)

**16.2.3.3** A recovery schedule must be submitted within twenty (20) calendar days of written notification to the District of causes of delay.

### **16.3      No Additional Compensation for Delays Within Contractor's Control**

**16.3.1** Contractor is aware that governmental agencies, including, without limitation, the Division of the State Architect, the Department of General Services, gas companies, electrical utility companies, water districts, and other agencies may have to approve Contractor-prepared drawings or approve a proposed installation. Accordingly, Contractor shall include in its bid, time for possible review of its drawings and for reasonable delays and damages that may be caused by such agencies. Thus, Contractor is not entitled to make a claim for damages or delays arising from the review of Contractor's drawings.

**16.3.2** Contractor shall only be entitled to compensation for delay when all of the following conditions are met:

**16.3.2.1** The District is responsible for the delay;

**16.3.2.2** The delay is unreasonable under the circumstances involved;

**16.3.2.3** The delay was not within the contemplation of the District and Contractor;

**16.3.2.4** The delay could not have been avoided or mitigated by Contractor's reasonable diligence; and

**16.3.2.5** Contractor timely complies with the claims procedure of the Contract Documents.

### **16.4      Float or Slack in the Schedule**

Float or slack is the amount of time between the early start date and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule. Float or slack is not for the exclusive use of or benefit of either the District or the Contractor, but its use shall be determined solely by the District.

## **17.      CHANGES IN THE WORK**

### **17.1      No Changes Without Authorization**

**17.1.1** There shall be no change whatsoever in the Drawings, Specifications, or in the Work without an executed Change Order or a written Construction Change Directive authorized by the District as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District's governing board has authorized the same and the cost thereof has been approved in writing by Change Order or Construction Change Directive in advance of the changed Work being performed. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted and approved in writing in the Change Order or Construction Change Directive. Contractor shall be responsible for any costs incurred by the District for professional services and DSA fees and/or delay to the Project Schedule, if any, for DSA to review any request for changes to the DSA approved plans and specifications for the convenience of the Contractor and/or to accommodate the Contractor's means and methods. The provisions of



the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

**17.1.2** Contractor shall perform immediately all work that has been authorized by a fully executed Change Order or Construction Change Directive. Contractor shall be fully responsible for any and all delays and/or expenses caused by Contractor's failure to expeditiously perform this Work.

**17.1.3** Should any Change Order result in an increase in the Contract Price or extend the Contract Time, the cost of or length of extension in that Change Order shall be agreed to, in writing, by the District in advance of the Work by Contractor, and shall be subject to the monetary limitations set forth in Public Contract Code section 20118.4. In the event that Contractor proceeds with any change in Work without a Change Order executed by the District or Construction Change Directive, Contractor waives any claim of additional compensation or time for that additional work. Under no circumstances shall Contractor be entitled to any claim of additional compensation or time not expressly requested by Contractor in a Proposed Change Order or approved by District in an executed Change Order.

**17.1.4** Contractor understands, acknowledges, and agrees that the reason for District authorization is so that District may have an opportunity to analyze the Work and decide whether the District shall proceed with the Change Order or alter the Project so that a change in Work becomes unnecessary.

## **17.2 Architect Authority**

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Price, or an extension of the Contract Time, or a change that is inconsistent with the intent of the Contract Documents. These changes shall be effected by written Change Order, Construction Change Directive, by Architect's response(s) to RFI(s), or by Architect's Supplemental Instructions ("ASI").

## **17.3 Change Orders**

**17.3.1** A Change Order is a written instrument prepared and issued by the District and/or the Architect and signed by the District (as authorized by the District's Governing Board), the Contractor, the Architect, and approved by the Project Inspector (if necessary) and DSA (if necessary), stating their agreement regarding all of the following:

**17.3.1.1** A description of a change in the Work;

**17.3.1.2** The amount of the adjustment in the Contract Price, if any; and

**17.3.1.3** The extent of the adjustment in the Contract Time, if any.

## **17.4 Construction Change Directives**

**17.4.1** A Construction Change Directive is a written order prepared and issued by the District, the Construction Manager, and/or the Architect and signed by the District and the Architect, directing a change in the Work. The District may, as provided by law, by Construction Change Directive and without invalidating the

Contract, order changes in the Work consisting of additions, deletions, or other revisions. The adjustment to the Contract Price or Time, if any, is subject to the provisions of this section regarding Changes in the Work. If all or a portion of the Project is being funded by funds requiring approval by the State Allocation Board ("SAB"), these revisions may be subject to compensation once approval of same is received and funded by the SAB, and funds are released by the Office of Public School Construction ("OPSC"). Any dispute as to the adjustment in the Contract Price, if any, of the Construction Change Directive or timing of payment shall be resolved pursuant to the Payment and Claims and Disputes provisions herein.

**17.4.2** The District may issue a Construction Change Directive in the absence of agreement on the terms of a Change Order.

## **17.5      Force Account Directives**

**17.5.1** When work, for which a definite price has not been agreed upon in advance, is to be paid for on a force account basis, all direct costs necessarily incurred and paid by the Contractor for labor, material, and equipment used in the performance of that Work, shall be subject to the approval of the District and compensation will be determined as set forth herein.

**17.5.2** The District will issue a Force Account Directive to proceed with the Work on a force account basis, and a not-to-exceed budget will be established by the District.

**17.5.3** All requirements regarding direct cost for labor, labor burden, material, equipment, and markups on direct costs for overhead and profit described in this section shall apply to Force Account Directives. However, the District will only pay for actual costs verified in the field by the District or its authorized representative(s) on a daily basis.

**17.5.4** The Contractor shall be responsible for all cost related to the administration of Force Account Directive. The markup for overhead and profit for Contractor modifications shall be full compensation to the Contractor to administer Force Account Directive, and Contractor shall not be entitled to separately recover additional amounts for overhead and/or profit.

**17.5.5** The Contractor shall notify the District or its authorized representative(s) at least twenty-four (24) hours prior to proceeding with any of the force account work. Furthermore, the Contractor shall notify the District when it has consumed eighty percent (80%) of the budget, and shall not exceed the budget unless specifically authorized in writing by the District. The Contractor will not be compensated for force account work in the event that the Contractor fails to timely notify the District regarding the commencement of force account work, or exceeding the force account budget.

**17.5.6** The Contractor shall diligently proceed with the work, and on a daily basis, submit a daily force account report on a form supplied by the District no later than 5:00 p.m. each day. The report shall contain a detailed itemization of the daily labor, material, and equipment used on the force account work only. The names of the individuals performing the force account work shall be included on the daily force account reports. The type and model of equipment shall be identified and listed. The District will review the information contained in the

reports, and sign the reports no later than the next work day, and return a copy of the report to the Contractor for their records. The District will not sign, nor will the Contractor receive compensation for work the District cannot verify. The Contractor will provide a weekly force account summary indicating the status of each Force Account Directive in terms of percent complete of the not-to-exceed budget and the estimated percent complete of the work.

**17.5.7** In the event the Contractor and the District reach a written agreement on a set cost for the work while the work is proceeding based on a Force Account Directive, the Contractor's signed daily force account reports shall be discontinued and all previously signed reports shall be invalid.

## **17.6 Price Request**

### **17.6.1 Definition of Price Request**

A Price Request ("PR") is a written request prepared by the Architect requesting the Contractor to submit to the District and the Architect an estimate of the effect of a proposed change in the Work on the Contract Price and the Contract Time.

### **17.6.2 Scope of Price Request**

A Price Request shall contain adequate information, including any necessary Drawings and Specifications, to enable Contractor to provide the cost breakdowns required herein. The Contractor shall not be entitled to any additional compensation for preparing a response to a Price Request, whether ultimately accepted or not.

## **17.7 Proposed Change Order**

### **17.7.1 Definition of Proposed Change Order**

A Proposed Change Order ("PCO") is a written request prepared by the Contractor requesting that the District and the Architect issue a Change Order based upon a proposed change to the Work.

### **17.7.2 Changes in Contract Price**

A PCO shall include breakdowns and backup documentation pursuant to the revisions herein and sufficient, in the District's judgment, to validate any change in Contract Price. In no case shall Contractor or any of its Subcontractors be permitted to reserve rights for additional compensation for Change Order Work.

### **17.7.3 Changes in Time**

A PCO shall also include any changes in time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Construction Schedule as defined in the Contract Documents. The Contractor shall justify the proposed change in time by submittal of a schedule analysis that accurately shows the impact of the change on the critical path of the Construction Schedule ("Time Impact Analysis"). If Contractor fails to request a time extension in a PCO, including the Time Impact Analysis, then the Contractor is thereafter precluded from requesting, and waives any right to request, additional time and/or claim a delay. In no case shall

Contractor or any of its Subcontractors be permitted to reserve rights for additional time for Change Order Work. A PCO that leaves the amount of time requested blank, or states that such time requested is "to be determined", is not permitted and shall also constitute a waiver of any right to request additional time and/or claim a delay.

#### **17.7.4 Unknown and/or Unforeseen Conditions**

If there is an Allowance, then Contractor must submit a Request for Allowance Expenditure Directive, including supporting documentation as described below, to receive authorization for the release of funds from the Allowance. If cost of the unforeseen condition(s) exceed the Allowance, Contractor must submit a PCO requesting an increase in Contract Price and/or Contract Time that is based at least partially on Contractor's assertion that Contractor has encountered unknown and/or unforeseen condition(s) on the Project, then Contractor shall base the PCO on provable information that, beyond a reasonable doubt and to the District's satisfaction, demonstrates that the unknown and/or unforeseen condition(s) were actually unknown and/or unforeseen and that the condition(s) were reasonably unknown and/or unforeseen. If not, the District shall deny the PCO as unsubstantiated, and the Contractor shall complete the Project without any increase in Contract Price and/or Contract Time based on that PCO.

#### **17.7.5 Time to Submit Proposed Change Order**

Contractor shall submit its PCO within five (5) working days of the date Contractor discovers, or reasonably should have discovered, the circumstances giving rise to the PCO, unless additional time to submit a PCO is granted in writing by the District. Time is of the essence in Contractor's submission of PCOs so that the District can promptly investigate the basis for the PCO. Accordingly, if Contractor fails to submit its PCO within this timeframe, Contractor waives, releases, and discharges any right to assert or claim any entitlement to an adjustment of the Contract Price and/or Time based on circumstances giving rise to the PCO.

#### **17.7.6 Proposed Change Order Certification**

In submitting a PCO, Contractor certifies and affirms that the cost and/or time request is submitted in good faith, that the cost and/or time request is accurate and in accordance with the provisions of the Contract Documents, and the Contractor submits the cost and/or request for extension of time recognizing the significant civil penalties and treble damages which follow from making a false claim or presenting a false claim under Government Code section 12650 et seq.

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## 17.8 Format for Proposed Change Order

**17.8.1** The following format shall be used as applicable by the District and the Contractor (e.g. Change Orders, PCO's) to communicate proposed additions and deductions to the Contract, supported by attached documentation. Any spaces left blank will be deemed no change to cost or time.

	<b><u>WORK PERFORMED OTHER THAN BY CONTRACTOR</u></b>	<b><u>ADD</u></b>	<b><u>DEDUCT</u></b>
(a)	<b><u>Material</u></b> (attach suppliers' invoice or itemized quantity and unit cost plus sales tax)		
(b)	<b><u>Add Labor</u></b> (attach itemized hours and rates, fully encumbered)		
(c)	<b><u>Add Equipment</u></b> (attach suppliers' invoice)		
(d)	<b><u>Subtotal</u></b>		
(e)	<b><u>Add overhead and profit for any and all tiers of Subcontractor</u></b> , the total not to exceed ten percent (10%) of Item (d)		
(f)	<b><u>Subtotal</u></b>		
(g)	<b><u>Add Overhead and Profit for Contractor</u></b> , not to exceed five percent (5%) of Item (f)		
(h)	<b><u>Subtotal</u></b>		
(i)	<b><u>Add Bond and Insurance</u></b> , not to exceed one and a half percent (1.5%) of Item (h)		
(j)	<b><u>TOTAL</u></b>		
(k)	<b><u>Time</u></b> (zero unless indicated; "TBD" not permitted)	<b><u>Calendar Days</u></b>	

	<b><u>WORK PERFORMED BY CONTRACTOR</u></b>	<b><u>ADD</u></b>	<b><u>DEDUCT</u></b>
(a)	<b><u>Material</u></b> (attach itemized quantity and unit cost plus sales tax)		
(b)	<b><u>Add Labor</u></b> (attach itemized hours and rates, fully encumbered)		
(c)	<b><u>Add Equipment</u></b> (attach suppliers' invoice)		
(d)	<b><u>Subtotal</u></b>		
(e)	<b><u>Add Overhead and Profit for Contractor</u></b> , not to exceed fifteen percent (15%) of Item (d)		
(f)	<b><u>Subtotal</u></b>		
(g)	<b><u>Add Bond and Insurance</u></b> , not to exceed one and a half percent (1.5%) of Item (f)		
(h)	<b><u>TOTAL</u></b>		
(i)	<b><u>Time</u></b> (zero unless indicated; "TBD" not permitted)	<b><u>Calendar Days</u></b>	

**17.8.2 Labor.** Contractor shall be compensated for the costs of labor actually and directly utilized in the performance of the Work. Such labor costs shall be limited to field labor for which there is a prevailing wage rate classification. Wage rates for labor shall not exceed the prevailing wage rates in the locality of the Site and shall be in the labor classification(s) necessary for the performance of the Work. Labor costs shall exclude costs incurred by the Contractor in preparing

estimate(s) of the costs of the change in the Work, in the maintenance of records relating to the costs of the change in the Work, coordination and assembly of materials and information relating to the change in the Work or performance thereof, or the supervision and other overhead and general conditions costs associated with the change in the Work or performance thereof, including but not limited to the cost for the job superintendent.

**17.8.3 Materials.** Contractor shall be compensated for the costs of materials necessarily and actually used or consumed in connection with the performance of the change in the Work. Costs of materials may include reasonable costs of transportation from a source closest to the Site of the Work and delivery to the Site. If discounts by material suppliers are available for materials necessarily used in the performance of the change in the Work, they shall be credited to the District. If materials necessarily used in the performance of the change in the Work are obtained from a supplier or source owned in whole or in part by the Contractor, compensation therefor shall not exceed the current wholesale price for such materials. If, in the reasonable opinion of the District, the costs asserted by the Contractor for materials in connection with any change in the Work are excessive, or if the Contractor fails to provide satisfactory evidence of the actual costs of such materials from its supplier or vendor of the same, the costs of such materials and the District's obligation to pay for the same shall be limited to the then lowest wholesale price at which similar materials are available in the quantities required to perform the change in the Work. The District may elect to furnish materials for the change in the Work, in which event the Contractor shall not be compensated for the costs of furnishing such materials or any mark-up thereon.

**17.8.4 Equipment.** As a precondition to the District's duty to pay for Equipment rental or loading and transportation, Contractor shall provide satisfactory evidence of the actual costs of Equipment from the supplier, vendor or rental agency of same. Contractor shall be compensated for the actual cost of the necessary and direct use of Equipment in the performance of the change in the Work. Use of such Equipment in the performance of the change in the Work shall be compensated in increments of fifteen (15) minutes. Rental time for Equipment moved by its own power shall include time required to move such Equipment to the site of the Work from the nearest available rental source of the same. If Equipment is not moved to the Site by its own power, Contractor will be compensated for the loading and transportation costs in lieu of rental time. The foregoing notwithstanding, neither moving time or loading and transportation time shall be allowed if the Equipment is used for performance of any portion of the Work other than the change in the Work. Unless prior approval in writing is obtained by the Contractor from the Architect, the Project Inspector and the District, no costs or compensation shall be allowed for time while Construction Equipment is inoperative, idle or on standby, for any reason. Contractor shall not be entitled to an allowance or any other compensation for Equipment or tools used in the performance of change in the Work where such Equipment or tools have a replacement value of \$500.00 or less. Equipment costs claimed by the Contractor in connection with the performance of any Work shall not exceed rental rates established by distributors or construction equipment rental agencies in the locality of the Site; any costs asserted which exceed such rental rates shall not be allowed or paid. Unless otherwise specifically approved in writing by the Architect, the Project Inspector and the District, the allowable rate for the use of Equipment in connection with the Work shall constitute full compensation to the Contractor

for the cost of rental, fuel, power, oil, lubrication, supplies, necessary attachments, repairs or maintenance of any kind, depreciation, storage, insurance, labor (exclusive of labor costs of the Equipment operator), and any and all other costs incurred by the Contractor incidental to the use of such Equipment.

**17.8.5 Overhead and Profit.** The phrase "Overhead and Profit" shall include field and office supervisors and assistants, watchperson, use of small tools, consumable, insurance other than construction bonds and insurance required herein, and general field and home office expenses.

## **17.9 Change Order Certification**

**17.9.1** All Change Orders and PCOs must include the following certification by the Contractor:

**17.9.1.1** The undersigned Contractor approves the foregoing as to the changes, if any, to the Contract Price specified for each item, and as to the extension of time allowed, if any, for completion of the entire Work as stated herein, and agrees to furnish all labor, materials, and service, and perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq. It is understood that the changes herein to the Contract shall only be effective when approved by the governing board of the District.

**17.9.1.2** It is expressly understood that the value of the extra Work or changes expressly includes any and all of the Contractor's costs and expenses, direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Contractor is not entitled to separately recover amounts for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

## **17.10 Determination of Change Order Cost**

**17.10.1** The amount of the increase or decrease in the Contract Price from a Change Order, if any, shall be determined in one or more of the following ways as applicable to a specific situation and at the District's discretion:

**17.10.1.1** District acceptance of a PCO;

**17.10.1.2** By unit prices contained in Contractor's original bid;

**17.10.1.3** By agreement between District and Contractor.

## **17.11 Deductive Change Orders**

All deductive Change Order(s) must be prepared pursuant to the provisions herein. Where a portion of the Work is deleted from the Contract, the reasonable value of the deducted work less the value of work performed shall be considered the appropriate deduction. The value submitted on the Schedule of Values shall be used to calculate the credit amount unless the bid documentation is being held in escrow as part of the Contract Documents. Unit Prices, if any, may be used in District's discretion in

calculating reasonable value. If Contractor offers a proposed amount for a deductive Change Order(s), Contractor shall include a minimum of five percent (5%) total profit and overhead to be deducted with the amount of the work of the Change Order(s). If Subcontractor work is involved, Subcontractors shall also include a minimum of five percent (5%) profit and overhead to be deducted with the amount of its deducted work. Any deviation from this provision shall not be allowed.

#### **17.12     Addition or Deletion of Alternate Bid Item(s)**

If the Bid Form and Proposal includes proposal(s) for Alternate Bid Item(s), during Contractor's performance of the Work, the District may elect to add or delete any such Alternate Bid Item(s) if not included in the Contract at the time of award. If the District elects to add or delete Alternate Bid Item(s) after Contract award, the cost or credit for such Alternate Bid Item(s) shall be as set forth in the Bid Form and Proposal unless the parties agree to a different price and the Contract Time shall be adjusted by the number of days allocated in the Contract Documents. If days are not allocated in the Contract Documents, the Contract Time shall be equitably adjusted.

#### **17.13     Discounts, Rebates, and Refunds**

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omission in the Work as provided herein.

#### **17.14     Accounting Records**

With respect to portions of the Work performed by Change Orders and Construction Change Directives, the Contractor shall keep and maintain cost-accounting records satisfactory to the District, including, without limitation, Job Cost Reports as provided in these General Conditions, which shall be available to the District on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents. Such records shall include without limitation hourly records for Labor and Equipment and itemized records of materials and Equipment used that day in connection with the performance of any Work. All records maintained hereunder shall be subject to inspection, review and/or reproduction by the District, the Architect or the Project Inspector upon request. In the event that the Contractor fails or refuses, for any reason, to maintain or make available for inspection, review and/or reproduction such records, the District's reasonable good faith determination of the extent of adjustment to the Contract Price shall be final, conclusive, dispositive and binding upon Contractor.

#### **17.15     Notice Required**

If the Contractor desires to make a claim for an increase in the Contract Price, or any extension in the Contract Time for completion, it shall notify the District pursuant to the provisions herein, including the Article on Claims and Disputes. No claim shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such claim shall be authorized by a Change Order.



#### **17.16     Applicability to Subcontractors**

Any requirements under this Article shall be equally applicable to Change Orders or Construction Change Directives issued to Subcontractors by the Contractor to the extent as required by the Contract Documents.

#### **17.17     Alteration to Change Order Language**

Contractor shall not alter Change Orders or reserve time in Change Orders. Change Orders altered in violation of this provision, if in conflict with the terms set forth herein, shall be construed in accordance with the terms set forth herein. Contractor shall execute finalized Change Orders and proceed under the provisions herein with proper notice.

#### **17.18     Failure of Contractor to Execute Change Order**

Contractor shall be in default of the Contract if Contractor fails to execute a Change Order when the Contractor agrees with the addition and/or deletion of the Work in that Change Order.

### **18.     REQUEST FOR INFORMATION**

**18.1**       Any Request for Information shall reference all applicable Contract Document(s), including Specification section(s), detail(s), page number(s), drawing number(s), and sheet number(s), etc. The Contractor shall make suggestions and interpretations of the issue raised by each Request for Information. A Request for Information cannot modify the Contract Price, Contract Time, or the Contract Documents. Upon request by the District, Contractor shall provide an electronic copy of the Request for Information in addition to the hard copy.

**18.2**       The Contractor shall be responsible for any costs incurred for professional services that District may deduct from any amounts owing to the Contractor, if a Request for Information requests an interpretation or decision of a matter where the information sought is equally available to the party making the request. District, at its sole discretion, shall deduct from and/or invoice Contractor for all the professional services arising herein.

### **19.     PAYMENTS**

#### **19.1       Contract Price**

The Contract Price is stated in the Agreement and, including authorized adjustments, is the total amount payable by the District to the Contractor for performance of the Work under the Contract Documents.

#### **19.2       Applications for Progress Payments**

##### **19.2.1     Procedure for Applications for Progress Payments**

##### **19.2.1.1   Application for Progress Payment**

**19.2.1.1.1**   Not before the fifth (5th) day of each calendar month during the progress of the Work, Contractor shall submit to the District and the

Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be notarized, if required, and supported by the following or each portion thereof unless waived by the District in writing:

**19.2.1.1.1.1** The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

**19.2.1.1.1.2** The amount being requested under the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;

**19.2.1.1.1.3** The balance that will be due to each of such entities after said payment is made;

**19.2.1.1.1.4** A certification that the As-Built Drawings and annotated Specifications are current;

**19.2.1.1.1.5** Itemized breakdown of work done for the purpose of requesting partial payment;

**19.2.1.1.1.6** An updated and acceptable construction schedule in conformance with the provisions herein;

**19.2.1.1.1.7** The additions to and subtractions from the Contract Price and Contract Time;

**19.2.1.1.1.8** A total of the retentions held;

**19.2.1.1.1.9** Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time;

**19.2.1.1.1.10** The percentage of completion of the Contractor's Work by line item;

**19.2.1.1.1.11** Schedule of Values updated from the preceding Application for Payment;

**19.2.1.1.1.12** A duly completed and executed conditional waiver and release upon progress payment compliant with Civil Code section 8132 from the Contractor and each subcontractor of any tier and supplier to be paid from the current progress payment;

**19.2.1.1.1.13** A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 8134 from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payment(s); and

**19.2.1.1.1.14** A certification by the Contractor of the following:

The Contractor warrants title to all Work performed as of the date of this payment application has been completed in accordance with the Contract Documents for the Project. The Contractor further warrants that all amounts have been paid for work which previous Certificates for Payment were issued and payments received and all Work performed as of the date of this payment application is free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, workers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work, except those of which the District has been informed. Submission of sums which have no basis in fact or which Contractor knows are false are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code section 12650 et seq.

**19.2.1.1.1.15** The Contractor shall be subject to the False Claims Act set forth in Government Code section 12650 et seq. for information provided with any Application for Progress Payment.

**19.2.1.1.1.16** All remaining certified payroll records ("CPR(s)") for each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work for the period of the Application for Payment. As indicated herein, the District shall not make any payment to Contractor until:

**19.2.1.1.1.16.1** Contractor and/or its Subcontractor(s) provide electronic CPRs weekly for all weeks any journeyman, apprentice, worker or other employee was employed in connection with the Work directly to the DIR, or within ten (10) days of any request by the District or the DIR, and

**19.2.1.1.1.16.2** Any delay in Contractor and/or its Subcontractor(s) providing CPRs in a timely manner may directly delay the Contractor's payment.

**19.2.1.1.2** Applications received after June 20th will not be paid until the second week of July and applications received after December 12th will not be paid until the first week of January.

**19.2.2 Prerequisites for Progress Payments**

**19.2.2.1 First Payment Request:** The following items, if applicable, must be completed before the District will accept and/or process the Contractor's first payment request:

**19.2.2.1.1** Installation of the Project sign;

**19.2.2.1.2** Installation of field office;

**19.2.2.1.3** Installation of temporary facilities and fencing;

- 19.2.2.1.4** Schedule of Values;
- 19.2.2.1.5** Contractor's Construction Schedule;
- 19.2.2.1.6** Schedule of unit prices, if applicable;
- 19.2.2.1.7** Submittal Schedule;
- 19.2.2.1.8** Receipt by Architect of all submittals due as of the date of the payment application;
- 19.2.2.1.9** Copies of necessary permits;
- 19.2.2.1.10** Copies of authorizations and licenses from governing authorities;
- 19.2.2.1.11** Initial progress report;
- 19.2.2.1.12** Surveyor qualifications;
- 19.2.2.1.13** Written acceptance of District's survey of rough grading, if applicable;
- 19.2.2.1.14** List of all Subcontractors, with names, license numbers, telephone numbers, and Scope of Work;
- 19.2.2.1.15** All bonds and insurance endorsements; and
- 19.2.2.1.16** Resumes of Contractor's project manager, and if applicable, job site secretary, record documents recorder, and job site superintendent.

**19.2.2.2 Second Payment Request:** The District will not process the second payment request until and unless all submittals and Shop Drawings have been accepted for review by the Architect.

**19.2.2.3 No Waiver of Criteria:** Any payments made to Contractor where criteria set forth herein have not been met shall not constitute a waiver of said criteria by District. Instead, such payment shall be construed as a good faith effort by District to resolve differences so Contractor may pay its Subcontractors and suppliers. Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

### **19.3 Progress Payments**

#### **19.3.1 District's Approval of Application for Payment**

**19.3.1.1** Upon receipt of an Application for Payment, The District shall act in accordance with both of the following:

- 19.3.1.1.1** Each Application for Payment shall be reviewed by the District as soon as practicable after receipt for the purpose of determining that the Application for Payment is a proper Application for Payment.

**19.3.1.1.2** Any Application for Payment determined not to be a proper Application for Payment suitable for payment shall be returned to the Contractor as soon as practicable, but not later than seven (7) days, after receipt. An Application for Payment returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the Application for Payment is not proper. The number of days available to the District to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which the District exceeds this seven-day return requirement.

**19.3.1.1.3** An Application for Payment shall be considered properly executed if funds are available for payment of the Application for Payment, and payment is not delayed due to an audit inquiry by the financial officer of the District.

**19.3.1.2** The District's review of the Contractor's Application for Payment will be based on the District's and the Architect's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the District's and the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to:

**19.3.1.2.1** Observation of the Work for general conformance with the Contract Documents,

**19.3.1.2.2** Results of subsequent tests and inspections,

**19.3.1.2.3** Minor deviations from the Contract Documents correctable prior to completion, and

**19.3.1.2.4** Specific qualifications expressed by the Architect.

**19.3.1.3** District's approval of the certified Application for Payment shall be based on Contractor complying with all requirements for a fully complete and valid certified Application for Payment.

## **19.3.2 Payments to Contractor**

**19.3.2.1** Within thirty (30) days after approval of the Application for Payment, Contractor shall be paid a sum equal to ninety-five percent (95%) of the value of the Work performed (as verified by Architect and Inspector and certified by Contractor) up to the last day of the previous month, less the aggregate of previous payments and amount to be withheld. The value of the Work completed shall be Contractor's best estimate. No inaccuracy or error in said estimate shall operate to release the Contractor, or any Surety upon any bond, from damages arising from such Work, or from the District's right to enforce each and every provision of this Contract, and the District shall have the right subsequently to correct any error made in any estimate for payment.

**19.3.2.2** The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for Work performed, so long as any lawful or proper direction given by the District concerning the Work, or any portion thereof, remains incomplete.

**19.3.2.3** If the District fails to make any progress payment within thirty (30) days after receipt of an undisputed and properly submitted Application for Payment from the Contractor, the District shall pay interest to the Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

**19.3.3 No Waiver**

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the District may enforce each and every provision of this Contract. The District may correct or require correction of any error subsequent to any payment.

**19.4 Decisions to Withhold Payment**

**19.4.1 Reasons to Withhold Payment**

The District may withhold payment in whole, or in part, to the extent reasonably necessary to protect the District if, in the District's opinion, the representations to the District required herein cannot be made. The District may withhold payment, in whole, or in part, to such extent as may be necessary to protect the District from loss because of, but not limited to any of the following:

**19.4.1.1** Defective Work not remedied within **FORTY-EIGHT (48)** hours of written notice to Contractor.

**19.4.1.2** Stop Payment Notices or other liens served upon the District as a result of the Contract. Contractor agrees that the District may withhold up to 125% of the amount claimed in the Stop Payment Notice to answer the claim and to provide for the District's reasonable cost of any litigation pursuant to the stop payment notice.

**19.4.1.3** Liquidated damages assessed against the Contractor.

**19.4.1.4** The cost of completion of the Contract if there exists a reasonable doubt that the Work can be completed for the unpaid balance of the Contract Price or by the completion date.

**19.4.1.5** Damage to the District or other contractor(s).

**19.4.1.6** Unsatisfactory prosecution of the Work by the Contractor.

**19.4.1.7** Failure to store and properly secure materials.

**19.4.1.8** Failure of the Contractor to submit, on a timely basis, proper, sufficient, and acceptable documentation required by the Contract Documents, including, without limitation, a Construction Schedule, Schedule of Submittals, Schedule of Values, Monthly Progress Schedules, Shop Drawings, Product Data and samples, Proposed product lists, executed Change Orders, and/or verified reports.

**19.4.1.9** Failure of the Contractor to maintain As-Built Drawings.

**19.4.1.10** Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment.

**19.4.1.11** Unauthorized deviations from the Contract Documents.

**19.4.1.12** Failure of the Contractor to prosecute the Work in a timely manner in compliance with the Construction Schedule, established progress schedules, and/or completion dates.

**19.4.1.13** Failure to provide acceptable electronic certified payroll records, as required by the Labor Code, by these Contract Documents, or by written request; for each journeyman, apprentice, worker, or other employee employed by the Contractor and/or by each Subcontractor in connection with the Work for the period of the Application for Payment or if payroll records are delinquent or inadequate.

**19.4.1.14** Failure to properly pay prevailing wages as required in Labor Code section 1720 et seq., failure to comply with any other Labor Code requirements, and/or failure to comply with labor compliance monitoring and enforcement by the DIR.

**19.4.1.15** Allowing an unregistered subcontractor, as described in Labor Code section 1725.5, to engage in the performance of any work under this Contract.

**19.4.1.16** Failure to comply with any applicable federal statutes and regulations regarding minimum wages, withholding, payrolls and basic records, apprentice and trainee employment requirements, equal employment opportunity requirements, Copeland Act requirements, Davis-Bacon Act and related requirements, Contract Work Hours and Safety Standards Act requirements, if applicable.

**19.4.1.17** Failure to properly maintain or clean up the Site.

**19.4.1.18** Failure to timely indemnify, defend, or hold harmless the District.

**19.4.1.19** Any payments due to the District, including but not limited to payments for failed tests, utilities changes, or permits.

**19.4.1.20** Failure to pay Subcontractor(s) or supplier(s) as required by law and by the Contract Documents.

**19.4.1.21** Failure to pay any royalty, license or similar fees.

**19.4.1.22** Contractor is otherwise in breach, default, or in substantial violation of any provision of this Contract.

**19.4.1.23** Failure to perform any implementation and/or monitoring required by any SWPPP for the Project and/or the imposition of any penalties or fines therefore whether imposed on the District or Contractor.

#### **19.4.2     Reallocation of Withheld Amounts**

**19.4.2.1** District may, in its discretion, apply any withheld amount to pay outstanding claims or obligations as defined herein. In so doing, District shall make such payments on behalf of Contractor. If any payment is so made by District, then that amount shall be considered a payment made under Contract by District to Contractor and District shall not be liable to Contractor for any payment made in good faith. These payments may be made without prior judicial determination of claim or obligation. District will render Contractor an accounting of funds disbursed on behalf of Contractor.

**19.4.2.2** If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents or fails to perform any provision thereof, District may, after **FORTY-EIGHT (48)** hours' written notice to the Contractor and, without prejudice to any other remedy, make good such deficiencies. The District shall adjust the total Contract Price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work that is damaged, defective, or not done in accordance with Contract provisions, an equitable reduction in the Contract Price (of at least one hundred fifty percent (150%) of the estimated reasonable value of the nonconforming Work) shall be made therefor.

#### **19.4.3     Payment After Cure**

When Contractor removes the grounds for declining approval, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

### **19.5        Subcontractor Payments**

#### **19.5.1     Payments to Subcontractors**

No later than seven (7) days after receipt, or pursuant to Business and Professions Code section 7108.5 and Public Contract Code section 7107, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to its Sub-subcontractors in a similar manner.

#### **19.5.2     No Obligation of District for Subcontractor Payment**

The District shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

#### **19.5.3     Joint Checks**

District shall have the right in its sole discretion, if necessary for the protection of the District, to issue joint checks made payable to the Contractor and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any



contract between the District and a Subcontractor of any tier, or a material or equipment supplier, any obligation from the District to such Subcontractor or a material or equipment supplier, or rights in such Subcontractor or a material or equipment supplier against the District.

## **20. COMPLETION OF THE WORK**

### **20.1 Completion**

**20.1.1** District will accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District.

**20.1.2** The Work may only be accepted as complete by action of the governing board of the District.

**20.1.3** District, at its sole option, may accept completion of Contract and have the Notice of Completion recorded when the entire Work shall have been completed to the satisfaction of District, except for minor corrective items, as distinguished from incomplete items. If Contractor fails to complete all minor corrective items within fifteen (15) days after the date of the District's acceptance of completion, District shall withhold from the final payment one hundred fifty percent (150%) of an estimate of the amount sufficient to complete the corrective items, as determined by District, until the item(s) are completed.

**20.1.4** At the end of the 15-day period, if there are any items remaining to be corrected, District may elect to proceed as provided herein related to adjustments to Contract Price, and/or District's right to perform the Work of the Contractor.

### **20.2 Close-Out/Certification Procedures**

#### **20.2.1 Punch List**

The Contractor shall notify the Architect when Contractor considers the Work complete. Upon notification, Architect will prepare a list of minor items to be completed or corrected ("Punch List"). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

#### **20.2.2 Close-Out/Certification Requirements**

##### **20.2.2.1 Utility Connections**

Buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made and existing services reconnected.

##### **20.2.2.2 Record Drawings and Record Specifications**

**20.2.2.2.1** Contractor shall provide exact Record Drawings of the Work ("As-Builts") and Record Specifications upon completion of the Project and as a condition precedent to approval of final payment.

**20.2.2.2.2** Contractor shall obtain the Inspector's approval of the corrected prints and employ a competent draftsman to transfer the Record Drawings information to the most current version of AutoCAD that is, at that time, currently utilized for plan check submission by either the District, the Architect, OPSC, and/or DSA, and print a complete set of transparent sepias. When completed, Contractor shall deliver corrected sepias and diskette/CD/other data storage device acceptable to District with AutoCAD file to the District.

**20.2.2.2.3** Contractor is liable and responsible for any and all inaccuracies in the Record Drawings and Record Specifications, even if inaccuracies become evident at a future date.

**20.2.2.3 Maintenance Manuals:** Contractor shall prepare all operation and maintenance manuals and date as indicated in the Specifications.

**20.2.2.4 Source Programming:** Contractor shall provide all source programming for all items in the Project.

**20.2.2.5 Verified Reports:** Contractor shall completely and accurately fill out and file forms DSA 6-C or DSA 152 (or current form), as appropriate. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

## **20.3 Final Inspection**

**20.3.1** Contractor shall comply with Punch List procedures as provided herein, and maintain the presence of a Project Superintendent and Project Manager until the Punch List is complete to ensure proper and timely completion of the Punch List. Under no circumstances shall Contractor demobilize its forces prior to completion of the Punch List without District's prior written approval. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and District acceptance, Architect and Project Inspector will inspect the Work and shall submit to Contractor and District a final inspection report noting the Work, if any, required in order to complete in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.

**20.3.2** Upon Contractor's completion of all items on the Punch List and any other uncompleted portions of the Work, the Contractor shall notify the District and Architect, who shall again inspect such Work. If the Architect finds the Work complete and acceptable under the Contract Documents, the Architect will notify Contractor, who shall then jointly submit to the Architect and the District its final Application for Payment.

### **20.3.3 Final Inspection Requirements**

**20.3.3.1** Before calling for final inspection, Contractor shall determine that the following have been performed:

**20.3.3.1.1** The Work has been completed.

- 20.3.3.1.2** All life safety items are completed and in working order.
- 20.3.3.1.3** Mechanical and electrical Work are complete and tested, fixtures are in place, connected, and ready for tryout.
- 20.3.3.1.4** Electrical circuits scheduled in panels and disconnect switches labeled.
- 20.3.3.1.5** Painting and special finishes complete.
- 20.3.3.1.6** Doors complete with hardware, cleaned of protective film, relieved of sticking or binding, and in working order.
- 20.3.3.1.7** Tops and bottoms of doors sealed.
- 20.3.3.1.8** Floors waxed and polished as specified.
- 20.3.3.1.9** Broken glass replaced and glass cleaned.
- 20.3.3.1.10** Grounds cleared of Contractor's equipment, raked clean of debris, and trash removed from Site.
- 20.3.3.1.11** Work cleaned, free of stains, scratches, and other foreign matter, and damaged and broken material replaced.
- 20.3.3.1.12** Finished and decorative work shall have marks, dirt, and superfluous labels removed.
- 20.3.3.1.13** Final cleanup, as provided herein.

## **20.4      Costs of Multiple Inspections**

More than two (2) requests of the District to make a final inspection shall be considered an additional service of District, Architect, Construction Manager, and/or Project Inspector, and all subsequent costs will be invoiced to Contractor and if funds are available, withheld from remaining payments.

## **20.5      Partial Occupancy or Use Prior to Completion**

### **20.5.1      District's Rights to Occupancy**

The District may occupy or use any completed or partially completed portion of the Work at any stage, and such occupancy shall not constitute the District's Final Acceptance of any part of the Work. Neither the District's Final Acceptance, the making of Final Payment, any provision in Contract Documents, nor the use or occupancy of the Work, in whole or in part, by District shall constitute acceptance of Work not in accordance with the Contract Documents nor relieve the Contractor or the Contractor's Performance Bond Surety from liability with respect to any warranties or responsibility for faulty or defective Work or materials, equipment and workmanship incorporated therein. In the event that the District occupies or uses any completed or partially completed portion of the Work, the Contractor shall remain responsible for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement

of warranties required by the Contract Documents unless the Contractor requests in writing, and the District agrees, to otherwise divide those responsibilities. Any dispute as to responsibilities shall be resolved pursuant to the Claims and Disputes provisions herein, with the added provision that during the dispute process, the District shall have the right to occupy or use any portion of the Work that it needs or desires to use.

#### **20.5.2 Inspection Prior to Occupancy or Use**

Immediately prior to partial occupancy or use, the District, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

#### **20.5.3 No Waiver**

Unless otherwise agreed upon, partial or entire occupancy or use of a portion or portions of the Work shall not constitute beneficial occupancy or District's acceptance of the Work not complying with the requirements of the Contract Documents.

### **21. FINAL PAYMENT AND RETENTION**

#### **21.1 Final Payment**

Upon receipt and approval of a valid and final Application for Payment, the Architect will issue a final Certificate of Payment. The District shall thereupon jointly inspect the Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon District's acceptance of the Work of the Contractor as fully complete by the Governing Board of the District (that, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of final payment from the District, pay the amount due Subcontractors.

#### **21.2 Prerequisites for Final Payment**

The following conditions must be fulfilled prior to Final Payment:

**21.2.1** A full release of all Stop Payment Notices served in connection with the Work shall be submitted by Contractor.

**21.2.2** A duly completed and executed conditional waiver and release upon final payment compliant with Civil Code section 8136, from the Contractor and each subcontractor of any tier and supplier to be paid from the final payment.

**21.2.3** A duly completed and executed unconditional waiver and release upon progress payment compliant with Civil Code section 8134, from the Contractor and each subcontractor of any tier and supplier that was paid from the previous progress payments.

**21.2.4** A duly completed and executed Document 00 65 19.26, "AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS" from the Contractor.

**21.2.5** The Contractor shall have made all corrections to the Work that are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.

**21.2.6** Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

**21.2.7** Contractor must have completed all requirements set forth under "Close-Out/Certification Procedures," including, without limitation, submission of an approved set of complete Record Drawings.

**21.2.8** Architect shall have issued its written approval that final payment can be made.

**21.2.9** The Contractor shall have delivered to the District all manuals and materials required by the Contract Documents, which must be approved by the District.

**21.2.10** The Contractor shall have completed final clean-up as provided herein.

### **21.3      Retention**

**21.3.1** The retention, less any amounts disputed by the District or that the District has the right to withhold pursuant to provisions herein, shall be paid:

**21.3.1.1** After approval by the Architect of the Application and Certificate of Payment,

**21.3.1.2** After the satisfaction of the conditions set forth herein, and

**21.3.1.3** After forty-five (45) days after the recording of the Notice of Completion by District.

**21.3.2** No interest shall be paid on any retention, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the District and the Contractor pursuant to Public Contract Code section 22300.

### **21.4      Substitution of Securities**

The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

## **22.      UNCOVERING OF WORK**

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the District, the Project Inspector, or the Architect, be uncovered for the Project Inspector's or the Architect's observation and be corrected, replaced, and/or recovered at the Contractor's expense without change in the Contract Price or Contract Time.

## **23. NONCONFORMING WORK AND CORRECTION OF WORK**

### **23.1 Nonconforming Work**

**23.1.1** Contractor shall promptly remove from Premises all Work identified by District as failing to conform to the Contract Documents whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract Documents without additional expense to the District and shall bear the expense of making good all work of other contractors destroyed or damaged by any removal or replacement pursuant hereto and/or any delays to the District or other Contractors caused thereby.

**23.1.2** If Contractor does not remove Work that District has identified as failing to conform to the Contract Documents within a reasonable time, not to exceed **FORTY-EIGHT (48)** hours, District may remove it and may store any material at Contractor's expense. If Contractor does not pay expense(s) of that removal within ten (10) days' time thereafter, District may, upon ten (10) days' written notice, sell any material at auction or at private sale and shall deduct all costs and expenses incurred by the District and/or District may withhold those amounts from payment(s) to Contractor.

### **23.2 Correction of Work**

#### **23.2.1 Correction of Rejected Work**

Pursuant to the notice provisions herein, the Contractor shall immediately correct the Work rejected by the District, the Architect, or the Project Inspector as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including additional testing, inspections, and compensation for the Inspector's or the Architect's services and expenses made necessary thereby.

#### **23.2.2 One-Year Warranty Corrections**

If, within one (1) year after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties established hereunder, or by the terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the District to do so. This period of one (1) year shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation hereunder shall survive District's acceptance of the Work under the Contract and termination of the Contract. The District shall give such notice promptly after discovery of the condition.

### **23.3 District's Right to Perform Work**

**23.3.1** If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this contract, the District, after **FORTY-EIGHT (48)** hours written notice to the Contractor, may, without prejudice to any other

remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

**23.3.2** If it is found at any time, before or after completion of the Work, that Contractor has varied from the Drawings and/or Specifications, including, but not limited to, variation in material, quality, form, or finish, or in the amount or value of the materials and labor used, District may require at its option:

**23.3.2.1** That all such improper Work be removed, remade or replaced, and all work disturbed by these changes be made good by Contractor at no additional cost to the District;

**23.3.2.2** That the District deduct from any amount due Contractor the sum of money equivalent to the difference in value between the work performed and that called for by the Drawings and Specifications; or

**23.3.2.3** That the District exercise any other remedy it may have at law or under the Contract Documents, including but not limited to the District hiring its own forces or another contractor to replace the Contractor's nonconforming Work, in which case the District shall either issue a deductive Change Order, a Construction Change Directive, or invoice the Contractor for the cost of that work. Contractor shall pay any invoices within thirty (30) days of receipt of same or District may withhold those amounts from payment(s) to Contractor.

## **24. TERMINATION AND SUSPENSION**

### **24.1 District's Right to Terminate Contractor for Cause**

**24.1.1 Grounds for Termination:** The District, in its sole discretion, may terminate the Contract and/or terminate the Contractor's right to perform the work of the Contract based upon any of the following:

**24.1.1.1** Contractor refuses or fails to execute the Work or any separable part thereof with sufficient diligence as will ensure its completion within the time specified or any extension thereof, or

**24.1.1.2** Contractor fails to complete said Work within the time specified or any extension thereof, or

**24.1.1.3** Contractor persistently fails or refused to perform Work or provide material of sufficient quality as to be in compliance with Contract Documents; or

**24.1.1.4** Contractor persistently or repeatedly refuses fails, except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials to complete the Work in the time specified; or

**24.1.1.5** Contractor fails to make prompt payment to Subcontractors, or for material, or for labor; or

**24.1.1.6** Contractor persistently disregards laws, or ordinances, or instructions of District; or

**24.1.1.7** Contractor fails to supply labor, including that of Subcontractors, that is sufficient to prosecute the Work or that can work in harmony with all other elements of labor employed or to be employed on the Work; or

**24.1.1.8** Contractor or its Subcontractor(s) is/are otherwise in breach, default, or in substantial violation of any provision of this Contract, including but not limited to a lapse in licensing or registration.

**24.1.2 Notification of Termination**

**24.1.2.1** Upon the occurrence at District's sole determination of any of the above conditions, District may, without prejudice to any other right or remedy, serve written notice upon Contractor and its Surety of District's termination of this Contract and/or the Contractor's right to perform the work of the Contract. This notice will contain the reasons for termination. Unless, within three (3) days after the service of the notice, any and all condition(s) shall cease, and any and all violation(s) shall cease, or arrangement satisfactory to District for the correction of the condition(s) and/or violation(s) be made, this Contract shall cease and terminate. Upon Termination, Contractor shall not be entitled to receive any further payment until the entire Work is finished.

**24.1.2.2** Upon Termination, District may immediately serve written notice of tender upon Surety whereby Surety shall have the right to take over and perform this Contract only if Surety:

**24.1.2.2.1** Within three (3) days after service upon it of the notice of tender, gives District written notice of Surety's intention to take over and perform this Contract; and

**24.1.2.2.2** Commences performance of this Contract within three (3) days from date of serving of its notice to District.

**24.1.2.3** Surety shall not utilize Contractor in completing the Project if the District notifies Surety of the District's objection to Contractor's further participation in the completion of the Project. Surety expressly agrees that any contractor which Surety proposes to fulfill Surety's obligations is subject to District's approval. District's approval shall not be unreasonably withheld, conditioned or delayed.

**24.1.2.4** If Surety fails to notify District or begin performance as indicated herein, District may take over the Work and execute the Work to completion by any method it may deem advisable at the expense of Contractor and/or its Surety. Contractor and/or its Surety shall be liable to District for any excess cost or other damages the District incurs thereby. Time is of the essence in this Contract. If the District takes over the Work as herein provided, District may, without liability for so doing, take possession of and utilize in completing the Work such materials, appliances, plan, and other property belonging to Contractor as may be on the Site of the Work, in bonded storage, or previously paid for.



### **24.1.3 Effect of Termination**

**24.1.3.1** Contractor shall, only if ordered to do so by the District, immediately remove from the Site all or any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The District retains the right, but not the obligation, to keep and use any materials and personal property belonging to Contractor that have not been incorporated in the construction of the Work, or which are not in place in the Work. The Contractor and its Surety shall be liable upon the performance bond for all damages caused to the District by reason of the Contractor's failure to complete the Contract.

**24.1.3.2** In the event that the District shall perform any portion of, or the whole of the Work, pursuant to the provisions of the General Conditions, the District shall not be liable nor account to the Contractor in any way for the time within which, or the manner in which, the Work is performed by the District or for any changes the District may make in the Work or for the money expended by the District in satisfying claims and/or suits and/or other obligations in connection with the Work.

**24.1.3.3** In the event that the Contract is terminated for any reason, no allowances or compensation will be granted for the loss of any anticipated profit by the Contractor or any impact or impairment of Contractor's bonding capacity.

**24.1.3.4** If the expense to the District to finish the Work exceeds the unpaid Contract Price, Contractor and Surety shall pay difference to District within twenty-one (21) days of District's request.

**24.1.3.5** The District shall have the right (but shall have no obligation) to assume and/or assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the Contractor under its subcontracts with any or all Subcontractors. In the event of an assumption or assignment by the District, no Subcontractor shall have any claim against the District or third party for Work performed by Subcontractor or other matters arising prior to termination of the Contract. The District or any third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after assumption or assignment. Should the District so elect, the Contractor shall execute and deliver all documents and take all steps, including the legal assignment of its contractual rights, as the District may require, for the purpose of fully vesting in the District the rights and benefits of its Subcontractor under Subcontracts or other obligations or commitments. All payments due the Contractor hereunder shall be subject to a right of offset by the District for expenses and damages suffered by the District as a result of any default, acts, or omissions of the Contractor. Contractor must include this assignment provision in all of its contracts with its Subcontractors.

**24.1.3.6** The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to District.

#### **24.1.4     Emergency Termination of Public Contracts Act of 1949**

**24.1.4.1** This Contract is subject to termination as provided by sections 4410 and 4411 of the Government Code of the State of California, being a portion of the Emergency Termination of Public Contracts Act of 1949.

**24.1.4.1.1** Section 4410 of the Government Code states:

In the event a national emergency occurs, and public work, being performed by contract, is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment or labor, as the result of an order or a proclamation of the President of the United States, or of an order of any federal authority, and the circumstances or conditions are such that it is impracticable within a reasonable time to proceed with a substantial portion of the work, then the public agency and the contractor may, by written agreement, terminate said contract.

**24.1.4.1.2** Section 4411 of the Government Code states:

Such an agreement shall include the terms and conditions of the termination of the contract and provision for the payment of compensation or money, if any, which either party shall pay to the other or any other person, under the facts and circumstances in the case.

**24.1.4.2** Compensation to the Contractor shall be determined at the sole discretion of District on the basis of the reasonable value of the Work done, including preparatory work. As an exception to the foregoing and at the District's discretion, in the case of any fully completed separate item or portion of the Work for which there is a separate previously submitted unit price or item on the accepted schedule of values, that price shall control. The District, at its sole discretion, may adopt the Contract Price as the reasonable value of the work done or any portion thereof.

#### **24.2     Termination of Contractor for Convenience**

**24.2.1** District in its sole discretion may terminate the Contract upon three (3) days' written notice to the Contractor. Under a termination for convenience, the District retains the right to all the options available to the District if there is a termination for cause. In case of a termination for convenience, the Contractor shall have no claims against the District except:

**24.2.1.1** The actual cost for labor, materials, and services performed that is unpaid and adequately documented through timesheets, invoices, receipts, or otherwise, and

**24.2.1.2** Five percent (5%) of the total cost of work performed as of the date of termination, or five percent (5%) of the value of the Work yet to be performed, whichever is less. This five percent (5%) amount shall be full compensation for all Contractor's and Subcontractor(s)' mobilization and/or demobilization costs and any anticipated loss profits resulting from termination of the Contractor for convenience.

## **24.3      Suspension of Work**

**24.3.1** District in its sole discretion may suspend, delay or interrupt the Work in whole or in part for such period of time as the District may determine upon three (3) days written notice to the Contractor.

**24.3.1.1** An adjustment may be made for changes in the cost of performance of the Work caused by any such suspension, delay or interruption. No adjustment shall be made to the extent:

**24.3.1.1.1** That performance is, was or would have been so suspended, delayed or interrupted by another cause for which Contractor is responsible; or

**24.3.1.1.2** That an equitable adjustment is made or denied under another provision of the Contract; or

**24.3.1.1.3** That the suspension of Work was the direct or indirect result of Contractor's failure to perform any of its obligations hereunder.

**24.3.1.2** Any adjustments in cost of performance may have a fixed or percentage fee as provided in the section on Format for Proposed Change Order herein. This amount shall be full compensation for all Contractor's and its Subcontractor(s)' changes in the cost of performance of the Contract caused by any such suspension, delay or interruption.

## **25.      CLAIMS PROCESS**

### **25.1      Performance during Claim Process**

Contractor and its subcontractors shall continue to perform its Work under the Contract and shall not cause a delay of the Work during any dispute, claim, negotiation, mediation, or arbitration proceeding, except by written agreement by the District.

### **25.2      Definition of Claim**

**25.2.1** Pursuant to Public Contract Code section 9204, the term "Claim" means a separate demand by the Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

**25.2.1.1** A time extension, including without limitation, for relief of damages or penalties for delay assessed by the District under the Contract;

**25.2.1.2** Payment by the District of money or damages arising from work done by, or on behalf of, the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or to which Contractor is not otherwise entitled to; or

**25.2.1.3** An amount of payment disputed by the District.

## **25.3      Claims Presentation**

**25.3.1** If Contractor intends to apply for an increase in the Contract Price or Contract Time for any reason including, without limitation, the acts of District or its agents, Contractor shall, within thirty (30) days after the event giving rise to the Claim, give notice of the Claim in writing, including an itemized statement of the details and amounts of its Claim for any increase in the Contract Price of Contract Time, including a Schedule Analysis and any and all other documentation substantiating Contractor's claimed damages. Otherwise, Contractor shall have waived and relinquished its dispute against the District and Contractor's claims for compensation or an extension of time shall be forfeited and invalidated. Likewise, failure to timely submit a claim and the requisite supporting documentation shall constitute a waiver of such claim.

**25.3.2** The Claim shall identify:

**25.3.2.1** The issues, events, conditions, circumstances and/or causes giving rise to the dispute, and shall show, in detail, the cause and effect of same;

**25.3.2.2** The pertinent dates and/or durations and actual and/or anticipated effects on the Contract Price, Contract Schedule milestones and/or Contract Time adjustments;

**25.3.2.3** The line-item costs for labor, material, and/or equipment, if applicable; or

**25.3.2.4** A request by Contractor, if any, to waive the claims procedure under Public Contract Code section 9204 and proceed directly to the commencement of a civil action or binding arbitration.

**25.3.3** The Claim shall include the following certification by the Contractor:

**25.3.3.1** The undersigned Contractor certifies under penalty of perjury that the attached dispute is made in good faith; that the supporting data is accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the adjustment for which Contractor believes the District is liable; and that I am duly authorized to certify the dispute on behalf of the Contractor.

**25.3.3.2** Furthermore, Contractor understands that the value of the attached dispute expressly includes any and all of the Contractor's costs and expenses, direct and indirect, resulting from the Work performed on the Project, additional time required on the Project and/or resulting from delay to the Project. Contractor may not separately recover for overhead or other indirect costs. Any costs, expenses, damages, or time extensions not included are deemed waived.

## **25.4 Claim Resolution pursuant to Public Contract Code section 9204**

### **25.4.1 STEP 1:**

**25.4.1.1** Upon receipt of a Claim by registered or certified mail, return receipt requested, including the documents necessary to substantiate it, the District shall conduct a reasonable review of the Claim and, within a period **not to exceed 45 days**, shall provide the Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed. Upon receipt of a Claim, the District and Contractor may, **by mutual agreement, extend the time period** to provide a written statement. If the District needs approval from its governing body to provide the Contractor a written statement identifying the disputed portion and the undisputed portion of the Claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of Claim sent by registered mail or certified mail, return receipt requested, the District shall have **up to three (3) days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension**, expires to provide Contractor a written statement identifying the disputed portion and the undisputed portion.

**25.4.1.1.1** Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its written statement. Amounts not paid in a timely manner as required by this section, section 25.4, shall bear interest at seven percent (7%) per annum.

**25.4.1.2** Upon receipt of a Claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable. In this instance, District and Contractor must comply with the sections below regarding Public Contract Code section 20104 et seq. and Government Code Claim Act Claims.

**25.4.1.3** If the District fails to issue a written statement, or to otherwise meet the time requirements of this section, this shall result in the Claim being deemed rejected in its entirety. A Claim that is denied by reason of the District's failure to have responded to a Claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the Claim or the responsibility or qualifications of Contractor.

### **25.4.2 STEP 2:**

**25.4.2.1** If Contractor disputes the District's written response, or if the District fails to respond to a Claim within the time prescribed, Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the District shall schedule a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the District shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed.

**25.4.2.1.1.1** Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the District issues its

written statement. Amounts not paid in a timely manner as required by this section, section 25.4, shall bear interest at seven percent (7%) per annum.

#### **25.4.3 STEP 3:**

**25.4.3.1** Any disputed portion of the Claim, as identified by Contractor in writing, shall be submitted to nonbinding mediation, with the District and Contractor sharing the associated costs equally. The District and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the Claim remaining in dispute shall be subject to applicable procedures outside this section.

**25.4.3.1.1** For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

**25.4.3.2** Unless otherwise agreed to by the District and Contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Public Contract Code section 20104.4 to mediate after litigation has been commenced.

#### **25.4.4 STEP 4:**

**25.4.4.1** If mediation under this section does not resolve the parties' dispute, the District may, but does not require arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program.

### **25.5 Subcontractor Pass-Through Claims**

**25.5.1** If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a District because privity of contract does not exist, the contractor may present to the District a Claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that Contractor present a Claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the Claim be presented to the District shall furnish reasonable documentation to support the Claim.

**25.5.2** Within 45 days of receipt of this written request from a subcontractor, Contractor shall notify the subcontractor in writing as to whether the Contractor presented the Claim to the District and, if Contractor did not present the Claim, provide the subcontractor with a statement of the reasons for not having done so.

**25.5.3** The Contractor shall bind all its Subcontractors to the provisions of this section and will hold the District harmless against Claims by Subcontractors.

**25.6 Government Code Claim Act Claim**

**25.6.1** If a claim, or any portion thereof, remains in dispute upon satisfaction of all applicable Claim Resolution requirements, including those pursuant to Public Contract Code section 9204, the Contractor shall comply with all claims presentation requirements as provided in Chapter 1 (commencing with section 900) and Chapter 2 (commencing with section 910) of Part 3 of Division 3.6 of Title 1 of Government Code as a condition precedent to the Contractor's right to bring a civil action against the District. For purposes of those provisions, the running of the time within which a claim must be presented to the District shall be tolled from the time Contractor submits its written Claim until the time the Claim is denied, including any time utilized by any applicable meet and confer process.

**25.7 Claim Resolution pursuant to Public Contract Code section 20104 et seq.**

**25.7.1** In the event of a disagreement between the parties as to performance of the Work, the interpretation of this Contract, or payment or nonpayment for Work performed or not performed, the parties shall attempt to resolve all claims of three hundred seventy-five thousand dollars (\$375,000) or less which arise between Contractor and District by those procedures set forth in Public Contract Code section 20104, et seq., to the extent applicable.

**25.7.1.1** Contractor shall file with the District any written Claim, including the documents necessary to substantiate it, upon the application for final payment.

**25.7.1.2** For claims of less than fifty thousand dollars (\$50,000), the District shall respond in writing within forty-five (45) days of receipt of the Claim or may request in writing within thirty (30) days of receipt of the Claim any additional documentation supporting the Claim or relating to defenses or claims the District may have against the Contractor.

**25.7.1.2.1** If additional information is required, it shall be requested and provided by mutual agreement of the parties.

**25.7.1.2.2** District's written response to the documented Claim shall be submitted to the Contractor within fifteen (15) days after receipt of the further documentation or within a period of time no greater than that taken by the Contractor to produce the additional information, whichever is greater.

**25.7.1.3** For claims of over fifty thousand dollars (\$50,000) and less than or equal to three hundred seventy-five thousand dollars (\$375,000), the District shall respond in writing to all written Claims within sixty (60) days of receipt of the claim, or may request, in writing, within thirty (30) days of receipt of the Claim any additional documentation supporting the Claim or relating to defenses or claims the District may have against the Contractor.

**25.7.1.3.1** If additional information is required, it shall be requested and provided upon mutual agreement of the District and the Contractor.

**25.7.1.3.2** The District's written response to the Claim, as further documented, shall be submitted to the Contractor within thirty (30) days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor to produce the additional information or requested documentation, whichever is greater.

**25.7.1.4** If Contractor disputes the District's written response, or the District fails to respond within the time prescribed, Contractor may so notify the District, in writing, either within fifteen (15) days of receipt of the District's response or within fifteen (15) days of the District's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the District shall schedule a meet and confer conference within thirty (30) days for settlement of the dispute.

**25.7.1.5** Following the meet and confer conference, if the Claim or any portion of it remains in dispute, the Contractor may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions the running of the time within which a claim must be filed shall be tolled from the time the Contractor submits its written Claim until the time the Claim is denied, including any period of time utilized by the meet and confer process.

**25.7.1.6** For any civil action filed to resolve claims filed pursuant to this section, within sixty (60) days, but no earlier than thirty (30) days, following the filing of responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within fifteen (15) days by both parties of a disinterested third person as mediator, shall be commenced within thirty (30) days of the submittal, and shall be concluded within fifteen (15) days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

**25.7.1.7** If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of the Title 3 of Part 3 of the Code of Civil Procedure, notwithstanding Section 1141.11 of that code. The Civil Discovery Act of 1986, (Article 3 (commencing with Section 2016) of Chapter 3 of Title 3 of part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

**25.7.1.8** The District shall not fail to pay money as to any portion of a Claim which is undisputed except as otherwise provided in the Contract Documents. In any suit filed pursuant to this section, the District shall pay interest due at the legal rate on any arbitration award or judgment. Interest shall begin to accrue on the date the suit is filed in a court of law.

**25.7.2** Contractor shall bind its Subcontractors to the provisions of this Section and will hold the District harmless against disputes by Subcontractors.



## **25.8 Claim Resolution Non-Applicability**

**25.8.1** The procedures for dispute and claim resolutions set forth in this Article shall not apply to the following:

**25.8.1.1** Personal injury, wrongful death or property damage claims;

**25.8.1.2** Latent defect or breach of warranty or guarantee to repair;

**25.8.1.3** Stop payment notices;

**25.8.1.4** District's rights set forth in the Article on Suspension and Termination;

**25.8.1.5** Disputes arising out of labor compliance enforcement by the Department of Industrial Relations; or

**25.8.1.6** District rights and obligations as a public entity set forth in applicable statutes; provided, however, that penalties imposed against a public entity by statutes, including, but not limited to, Public Contract Code sections 20104.50 and 7107, shall be subject to the Claim Resolution requirements provided in this Article.

## **25.9 Attorney's Fees**

**25.9.1** Should litigation be necessary to enforce any terms or provisions of this Agreement, then each party shall bear its own litigation and collection expenses, witness fees, court costs and attorney's fees.

## **26. STATE LABOR, WAGE & HOUR, APPRENTICE, AND RELATED PROVISIONS**

### **26.1 Labor Compliance and Enforcement**

Since this Project is subject to labor compliance and enforcement by the Department of Industrial Relations ("DIR"), Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code and Title 8 of the California Code of Regulations, including, without limitation, the requirement that the Contractor and all Subcontractors shall timely furnish complete and accurate electronic certified payroll records directly to the DIR. The District may not issue payment if this requirement is not met.

### **26.2 Wage Rates, Travel, and Subsistence**

**26.2.1** Pursuant to the provisions of Article 2 (commencing at section 1770), Chapter 1, Part 7, Division 2, of the Labor Code, the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed to execute this Contract are on file at the District's principal office and copies will be made available to any interested party on request. Contractor shall obtain and post a copy of these wage rates at the job site.

**26.2.2** Holiday and overtime work, when permitted by law, shall be paid for at the general prevailing rate of per diem wages for holiday and overtime work on file with the Director of the Department of Industrial Relations, unless otherwise specified. The holidays upon which those rates shall be paid need not be specified by the District, but shall be all holidays recognized in the applicable collective bargaining agreement. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code.

**26.2.3** Contractor shall pay and shall cause to be paid each worker engaged in Work on the Project the general prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations, regardless of any contractual relationship which may be alleged to exist between Contractor or any Subcontractor and such workers.

**26.2.4** If during the period this bid is required to remain open, the Director of the Department of Industrial Relations determines that there has been a change in any prevailing rate of per diem wages in the locality in which the Work under the Contract is to be performed, such change shall not alter the wage rates in the Notice to Bidders or the Contract subsequently awarded.

**26.2.5** Pursuant to Labor Code section 1775, Contractor shall, as a penalty to District, forfeit the statutory amount (believed by the District to be currently up to two hundred dollars (\$200) for each calendar day, or portion thereof, for each worker paid less than the prevailing rates, determined by the District and/or the Director, for the work or craft in which that worker is employed for any public work done under Contract by Contractor or by any Subcontractor under it. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing wage rate shall be paid to each worker by Contractor.

**26.2.6** Any worker employed to perform Work on the Project, which Work is not covered by any classification listed in the general prevailing wage rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to Work to be performed by him, and such minimum wage rate shall be retroactive to time of initial employment of such person in such classification.

**26.2.7** Pursuant to Labor Code section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel time, subsistence pay, and apprenticeship or other training programs authorized by Labor Code section 3093, and similar purposes.

**26.2.8** Contractor shall post at appropriate conspicuous points on the Site of Project, a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned. In addition, Contractor shall post a sign-in log for all workers and visitors to the Site, a list of all subcontractors of any tier on the Site, and the required Equal Employment Opportunity poster(s).

## **26.3      Hours of Work**

**26.3.1** As provided in article 3 (commencing at section 1810), chapter 1, part 7, division 2, of the Labor Code, eight (8) hours of labor shall constitute a legal day's work. The time of service of any worker employed at any time by Contractor or by any Subcontractor on any subcontract under this Contract upon the Work or upon any part of the Work contemplated by this Contract shall be limited and restricted by Contractor to eight (8) hours per day, and forty (40) hours during any one week, except as hereinafter provided. Notwithstanding the provisions hereinabove set forth, Work performed by employees of Contractor in excess of eight (8) hours per day and forty (40) hours during any one week, shall be permitted upon this public work upon compensation for all hours worked in excess of eight (8) hours per day at not less than one and one-half times the basic rate of pay.

**26.3.2** Contractor shall keep and shall cause each Subcontractor to keep an accurate record showing the name of and actual hours worked each calendar day and each calendar week by each worker employed by Contractor in connection with the Work or any part of the Work contemplated by this Contract. The record shall be kept open at all reasonable hours to the inspection of District and to the Division of Labor Standards Enforcement of the DIR.

**26.3.3** Pursuant to Labor Code section 1813, Contractor shall as a penalty to the District forfeit the statutory amount (believed by the District to be currently twenty-five dollars (\$25)) for each worker employed in the execution of this Contract by Contractor or by any Subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one calendar day and forty (40) hours in any one calendar week in violation of the provisions of article 3 (commencing at section 1810), chapter 1, part 7, division 2, of the Labor Code.

**26.3.4** Any Work necessary to be performed after regular working hours, or on Sundays or other holidays shall be performed without additional expense to the District.

## **26.4      Payroll Records**

**26.4.1** Contractor shall upload, and shall cause each Subcontractor performing any portion of the Work under this Contract to upload, an accurate and complete certified payroll record ("CPR") electronically using DIR's eCPR System by uploading the CPRs by electronic XML file or entering each record manually using the DIR's iform (or current form) online on a weekly basis and within ten (10) days of any request by the District or Labor Commissioner at <http://www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html> or current application and URL, showing the name, address, social security number, work classification, straight-time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each Subcontractor in connection with the Work.

**26.4.1.1** The CPRs enumerated hereunder shall be filed directly with the DIR on a weekly basis or to the requesting party, whether the District or DIR, within ten (10) days after receipt of each written request. The CPRs from the Contractor

and each Subcontractor for each week shall be provided on or before Wednesday of the week following the week covered by the CPRs. District may not make any payment to Contractor until:

**26.4.1.1.1** Contractor and/or its Subcontractor(s) provide CPRs acceptable to the DIR; and

**26.4.1.1.2** Any delay in Contractor and/or its Subcontractor(s) providing CPRs to the DIR in a timely manner may directly delay Contractor's payment.

**26.4.2** All CPRs shall be available for inspection at all reasonable hours at the principal office of Contractor on the following basis:

**26.4.2.1** A certified copy of an employee's CPR shall be made available for inspection or furnished to the employee or his/her authorized representative on request.

**26.4.2.2** CPRs shall be made available for inspection or furnished upon request to a representative of District, Division of Labor Standards Enforcement, Division of Apprenticeship Standards, and/or the DIR.

**26.4.2.3** CPRs shall be made available upon request by the public for inspection or copies thereof made; provided, however, that a request by the public shall be made through the District, Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement. If the requested CPRs have not been provided pursuant to the provisions herein, the requesting party shall, prior to being provided the records, reimburse the costs of preparation by Contractor, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at the principal office of Contractor.

**26.4.3** Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by District, Division of Apprenticeship Standards, or Division of Labor Standards Enforcement shall be marked or obliterated in such a manner as to prevent disclosure of an individual's name, address, and social security number. The name and address of Contractor awarded Contract or performing Contract shall not be marked or obliterated.

**26.4.4** Contractor shall inform District of the location of the records enumerated hereunder, including the street address, city, and county, and shall, within five (5) working days, provide a notice of change of location and address.

**26.4.5** In the event of noncompliance with the requirements of this section, Contractor shall have ten (10) days in which to comply subsequent to receipt of written notice specifying in what respects Contractor must comply with this section. Should noncompliance still be evident after the ten (10) day period, Contractor shall, as a penalty to District, forfeit up to one hundred dollars (\$100) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Labor Commissioner, these penalties shall be withheld from progress payments then due.

**26.4.6** **[RESERVED]**

**26.5      [RESERVED]**

**26.6      Apprentices**

**26.6.1** Contractor acknowledges and agrees that, if this Contract involves a dollar amount greater than or a number of working days greater than that specified in Labor Code section 1777.5, then this Contract is governed by the provisions of Labor Code Section 1777.5. It shall be the responsibility of Contractor to ensure compliance with this Article and with Labor Code section 1777.5 for all apprenticeship occupations.

**26.6.2** Apprentices of any crafts or trades may be employed and, when required by Labor Code section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

**26.6.3** Every such apprentice shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he/she is employed, and shall be employed only at the work of the craft or trade to which she/he is registered.

**26.6.4** Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprentice agreements under chapter 4 (commencing at section 3070), division 3, of the Labor Code, are eligible to be employed. The employment and training of each apprentice shall be in accordance with the provisions of the apprenticeship standards and apprentice agreements under which he/she is training.

**26.6.5** Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractors employing workers in any apprenticeable craft or trade in performing any Work under this Contract shall apply to the applicable joint apprenticeship committee for a certificate approving the Contractor or Subcontractor under the applicable apprenticeship standards and fixing the ratio of apprentices to journeymen employed in performing the Work.

**26.6.6** Pursuant to Labor Code section 1777.5, if that section applies to this Contract as indicated above, Contractor and any Subcontractor may be required to make contributions to the apprenticeship program.

**26.6.7** If Contractor or Subcontractor willfully fails to comply with Labor Code section 1777.5, then, upon a determination of noncompliance by the Administrator of Apprenticeship, it shall:

**26.6.7.1** Be denied the right to bid on any subsequent project for one (1) year from the date of such determination;

**26.6.7.2** Forfeit as a penalty to District the full amount as stated in Labor Code section 1777.7. Interpretation and enforcement of these provisions shall be in accordance with the rules and procedures of the California Apprenticeship Council and under the authority of the Chief of the Division of Apprenticeship Standards.

**26.6.8** Contractor and all Subcontractors shall comply with Labor Code section 1777.6, which section forbids certain discriminatory practices in the employment of apprentices.

**26.6.9** Contractor shall become fully acquainted with the law regarding apprentices prior to commencement of the Work. Special attention is directed to sections 1777.5, 1777.6, and 1777.7 of the Labor Code, and title 8, California Code of Regulations, section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, 9th floor, San Francisco, California 94102.

## **26.7 Non-Discrimination**

**26.7.1** Contractor herein agrees to comply with the provisions of the California Fair Employment and Housing Act as set forth in part 2.8 of division 3 of the California Government Code, commencing at section 12900; the Federal Civil Rights Act of 1964, as set forth in Public Law 88-352, and all amendments thereto; Executive Order 11246; and all administrative rules and regulations found to be applicable to Contractor and Subcontractor.

**26.7.2** Special requirements for Federally Assisted Construction Contracts: During the performance of this Contract, Contractor agrees to incorporate in all subcontracts the provisions set forth in Chapter 60-1.4(b) of Title 41 published in Volume 33 No. 104 of the Federal Register dated May 28, 1968.

## **26.8 Labor First Aid**

Contractor shall maintain emergency first aid treatment for Contractor's workers on the Project which complies with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C. § 651 et seq.) and the California Occupational Safety and Health Act of 1973 (Lab. Code, § 6300 et seq.; 8 Cal. Code of Regs., § 330 et seq.).

## **27. FEDERAL LABOR, WAGE & HOUR, APPRENTICE, AND RELATED PROVISIONS**

### **27.1 Minimum Wages**

1. The Davis-Bacon Act and 29 CFR parts 1 through 7 shall apply if the Project is financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution.

**27.1.1** All laborers and mechanics employed or working upon the Site of the Work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the Project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account, except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3) , the full amount of wages and bona fide fringe benefits, or cash equivalents thereof, due at time of payment computed at rates not less than those contained in the applicable wage determination of the Secretary of Labor regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of this section, including but not limited to paragraph 27.1.7; also, regular contributions made or costs incurred for more than a weekly period, but not less often than quarterly, under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of Work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing Work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which Work is performed. The wage determination including any additional classification and wage rates conformed under this section, including but not limited to paragraph 27.1.6 and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its Subcontractors at the Site of the Work in a prominent and accessible place where it can be easily seen by the workers.

**27.1.2** Any class of laborers or mechanics, including helpers, and which is to be employed under the Contract which is not listed in the wage determination shall be classified in conformance with the wage determination. An additional classification and wage rate and fringe benefits will not be approved unless when the following criteria have been met:

The Work to be performed by the classification requested is not performed by a classification in the wage determination; and

**27.1.2.1** The classification is utilized in the area by the construction industry; and

**27.1.2.2** The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

**27.1.3** If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the District agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contractor to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210.

**27.1.4** In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the District do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contractor shall provide the questions, including the views of all interested parties and the recommendation of the District, to the District for the District's review and referral to the Administrator for determination.

**27.1.5** The wage rate (including fringe benefits where appropriate) determined pursuant to this section, shall be paid to all workers performing Work in the classification under this Contract from the first day on which Work is performed in the classification.

**27.1.6** Whenever the minimum wage rate prescribed in any applicable wage determination for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

**27.1.7** If the Contractor does not make payments to a trustee or other third person, the Contractor may consider, as part of the wages of any laborer or mechanic, the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. If the Secretary of Labor so requires, the Contractor shall set aside in a separate account sufficient assets to meet obligations under the plan or program.

**27.2** **Withholding. District may, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same Contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any Subcontractor the full amount of wages required by the Contract. In the event of Contractor's or any Subcontractors' failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the Site of the Work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the Contract, the District may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as it deems necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.**

### **27.3 Payrolls and basic records.**

**27.3.1** Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the Work and preserved for a period of three years thereafter for all laborers and mechanics working at the Site of the Work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the



apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

**27.3.2** The Contractor shall submit weekly for each week in which any Contract Work is performed a copy of all payrolls to the District. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information shall be submitted on a form acceptable to the District. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <https://www.dol.gov/whd/programs/dbra/wh347.htm> or its successor site. Contractor is responsible for the submission of copies of payrolls by all Subcontractors. Contractor and Subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the District, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. Contractor may require a Subcontractor to provide addresses and social security numbers to the Contractor for its own records, without weekly submission to the District or other government agency

**27.3.3** Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or Subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

**27.3.3.1** That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5,

**27.3.3.2** That the appropriate information is being maintained under 29 CFR 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and

**27.3.3.3** That such information is correct and complete;

**27.3.3.4** That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and

**27.3.3.5** That no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

**27.3.3.6** That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of Work performed, as specified in the applicable wage determination incorporated into or applicable to the Contract.

**27.3.3.7** The weekly submission of a properly executed certification in the form set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 27.3.3 of this section.

**27.3.3.8** The falsification of any of the above certifications may subject the Contractor or one or more Subcontractors to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

**27.3.3.9** The Contractor or Subcontractor shall make the records required under this section available for inspection, copying, or transcription by authorized representatives of the District or the federal Department of Labor, and shall permit representatives to interview employees during working hours on the job. If the Contractor or Subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

## **27.4 Apprentices and trainees**

**27.4.1 Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the Work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first ninety (90) days of probationary employment as an apprentice in an eligible apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job Site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of Work actually performed. In addition, any apprentice performing Work on the job Site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the Work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or Subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the Work performed until an acceptable program is approved.

**27.4.2 Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to Work at less than the predetermined rate for the Work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job Site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of Work actually performed. In addition, any trainee performing Work on the job Site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the Work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the Work performed until an acceptable program is approved.

**27.4.3 Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

**27.5 Compliance with Copeland Act requirements. Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.**

**27.6 Subcontracts. The Contractor or Subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal agency may by appropriate instructions require, and also a clause requiring the Subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for the compliance by any Subcontractor or lower tier Subcontractor with all the Contract clauses in 29 CFR 5.5.**

**27.7 Contract termination: debarment. A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a Contractor and a Subcontractor as provided in 29 CFR 5.12.**

**27.8 Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.**

**27.9 Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance**

**with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its Subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.**

**27.10 Certification of eligibility.**

**27.10.1** By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

**27.10.2** No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

**27.10.3** Contractor shall be subject to the penalty for making false statements prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

**27.11 Clauses Mandated by Contract Work Hours and Safety Standards Act.**

As used in the following paragraphs, the terms laborers and mechanics include watchmen and guards.

**27.11.1 Overtime requirements.** No Contractor or Subcontractor contracting for any part of the Contract Work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such Work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

**27.11.2 Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in the foregoing paragraph the Contractor and any Subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and Subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the foregoing paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to Work in excess of the standard workweek of forty hours without payment of the overtime wages required by the foregoing paragraph.

**27.11.3 Withholding for unpaid wages and liquidated damages.** The District may upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of Work performed by the Contractor or Subcontractor under the Contract or any other Federal contract with the same Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or Subcontractor for unpaid wages and liquidated damages as provided in the foregoing paragraph.

**27.11.4 Subcontracts.** The Contractor or Subcontractor shall insert in any subcontracts the foregoing paragraphs concerning "Overtime requirements" and "Violation; liability for unpaid wages; liquidated damages" and also a clause requiring each Subcontractor to include these clauses in any lower tier subcontracts. Contractor shall be responsible for compliance by any Subcontractor or lower tier Subcontractor with the clauses set forth in paragraphs 27.11.1 through 27.11.4 of this section.

## **28. MISCELLANEOUS**

### **28.1 Assignment of Antitrust Actions**

#### **28.1.1** Section 7103.5(b) of the Public Contract Code states:

In entering into a public works contract or subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, which assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties.

#### **28.1.2** Section 4552 of the Government Code states:

In submitting a bid to a public purchasing body, the bidder offers and agrees that if the bid is accepted, it will assign to the purchasing body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, materials, or services by the bidder for sale to the purchasing body pursuant to the bid. Such assignment shall be made and become effective at the time the purchasing body tenders final payment to the bidder.

#### **28.1.3** Section 4553 of the Government Code states:

If an awarding body or public purchasing body receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under this chapter, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the public body any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the public body as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

#### **28.1.4** Section 4554 of the Government Code states:

Upon demand in writing by the assignor, the assignee shall, within one year from such demand, reassign the cause of action assigned under this part if the assignor has been or may have been injured by the violation of law for which the cause of action arose and (a) the assignee has not been injured thereby, or (b) the assignee declines to file a court action for the cause of action.

**28.1.5** Under this Article, "public purchasing body" is District and "bidder" is Contractor.

**28.2      Excise Taxes**

If, under Federal Excise Tax Law, any transaction hereunder constitutes a sale on which a Federal Excise Tax is imposed and the sale is exempt from such Federal Excise Tax because it is a sale to a State or Local Government for its exclusive use, District, upon request, will execute documents necessary to show (1) that District is a political subdivision of the State for the purposes of such exemption, and (2) that the sale is for the exclusive use of District. No Federal Excise Tax for such materials shall be included in any Contract Price.

**28.3      Taxes**

Contract Price is to include any and all applicable sales taxes or other taxes that may be due in accordance with section 7051 et seq. of the Revenue and Taxation Code, Regulation 1521 of the State Board of Equalization or any other tax code that may be applicable.

**28.4      Shipments**

All shipments must be F.O.B. destination to Site or sites, as indicated in the Contract Documents. There must be no charge for containers, packing, unpacking, drayage, or insurance. The total Contract Price shall be all inclusive (including sales tax) and no additional costs of any type will be considered.

**28.5      Compliance with Government Reporting Requirements**

If this Contract is subject to federal or other governmental reporting requirements because of federal or other governmental financing in whole or in part for the Project of which it is part, or for any other reason, Contactor shall comply with those reporting requirements at the request of the District at no additional cost.

END OF DOCUMENT

**SPECIAL CONDITIONS**

**SPECIAL CONDITIONS**

**1. Mitigation Measures (N/A)**

**2. Modernization Projects**

**2.1 Access.** Access to the school buildings and entry to buildings, classrooms, restrooms, mechanical rooms, electrical rooms, or other rooms, for construction purposes, must be coordinated with District and onsite District personnel before Work is to start. Unless agreed to otherwise in writing, only a school custodian will be allowed to unlock and lock doors in existing building(s). The custodian will be available only while school is in session. If a custodian is required to arrive before 7:00 a.m. or leave after 3:30 p.m. to accommodate Contractor's Work, the overtime wages for the custodian will be paid by the Contractor, unless at the discretion of the District, other arrangements are made in advance.

**2.2 Keys.** Upon request, the District may, at its own discretion, provide keys to the school site for the convenience of the Contractor. The Contractor agrees to pay all expenses to re-key the entire school site and all other affected District buildings if the keys are lost or stolen, or if any unauthorized party obtains a copy of the key or access to the school.

**2.3 Maintaining Services.** The Contractor is advised that Work is to be performed in spaces regularly scheduled for instruction. Interruption and/or periods of shutdown of public access, electrical service, water service, lighting, or other utilities shall be only as arranged in advance with the District. Contractor shall provide temporary services to all facilities interrupted by Contractor's Work.

**2.4 Maintaining Utilities.** The Contractor shall maintain in operation during duration of Contract, drainage lines, storm drains, sewers, water, gas, electrical, steam, and other utility service lines within working area.

**2.5 Confidentiality.** Contractor shall maintain the confidentiality of all information, documents, programs, procedures and all other items that Contractor encounters while performing the Work. This requirement shall be ongoing and shall survive the expiration or termination of this Contract and specifically includes, without limitation, all student, parent, and employee disciplinary information and health information.

**2.6 Work during Instructional Time.** By submitting its bid, Contractor affirms that Work may be performed during ongoing instruction in existing facilities. If so, Contractor agrees to cooperate to the best of its ability to minimize any disruption to

school operations and any use of school facilities by the public up to, and including, rescheduling specific work activities, at no additional cost to District.

**2.7      No Work during Student Testing.** Contractor shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State or Federally-required tests.

### **3.      Badge Policy for Contractors**

All Contractors doing work for the District will provide their workers with identification badges. These badges will be worn by all members of the Contractor's staff who are working in a District facility.

**3.1**              Badges must be filled out in full and contain the following information:

**3.1.1**              Name of Contractor

**3.1.2**              Name of Employee

**3.1.3**              Contractor's address and phone number

**3.2**              Badges are to be worn when the Contractor or his/her employees are on site and must be visible at all times. Contractors must inform their employees that they are required to allow District employees, the Architect, the Construction Manager, the Program Manager, or the Project Inspector to review the information on the badges upon request.

**3.3**              Continued failure to display identification badges as required by this policy may result in the individual being removed from the Project or assessment of fines against the Contractor.

### **4.      Substitution for Specified Items**

**4.1**              Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified.

**4.1.1**              If the material, process, or article offered by Contractor is not, in the opinion of the District, substantially equal or better in every respect to that specified, then Contractor shall furnish the material, process, or article specified in the Specifications without any additional compensation or change order.

**4.1.2**              This provision shall not be applicable with respect to any material, product, thing or service for which District made findings and gave notice in accordance with Public Contract Code section 3400(c); therefore, Contractor shall not be entitled to request a substitution with respect to those materials, products or services.



**4.2** A request for a substitution shall be submitted as follows:

**4.2.1** Contractor shall notify the District in writing of any request for a substitution at least ten (10) days prior to bid opening as indicated in the Instructions to Bidders.

~~**4.2.2** Requests for Substitutions after award of the Contract shall be submitted within thirty five (35) days of the date of the Notice of Award.~~

**4.3** Within 35 days after the date of the Notice of Award, Contractor shall provide data substantiating a request for substitution of "an equal" item, including but not limited to the following:

**4.3.1** All variations of the proposed substitute from the material specified including, but not limited to, principles of operation, materials, or construction finish, thickness or gauge of materials, dimensions, weight, and tolerances;

**4.3.2** Available maintenance, repair or replacement services;

**4.3.3** Increases or decreases in operating, maintenance, repair, replacement, and spare parts costs;

**4.3.4** Whether or not acceptance of the substitute will require other changes in the Work (or in work performed by the District or others under Contract with the District); and

**4.3.5** The time impact on any part of the Work resulting directly or indirectly from acceptance of the proposed substitute.

**4.4** No substitutions shall be made until approved, in writing, by the District. The burden of proof as to equality of any material, process, or article shall rest with Contractor. The Contractor warrants that if substitutes are approved:

**4.4.1** The proposed substitute is equal or superior in all respects to that specified, and that such proposed substitute is suitable and fit for the intended purpose and will perform adequately the function and achieve the results called for by the general design and the Contract Documents;

**4.4.2** The Contractor provides the same warranties and guarantees for the substitute that would be provided for that specified;

**4.4.3** The Contractor shall be fully responsible for the installation of the substitute and any changes in the Work required, either directly or indirectly, because of the acceptance of such substitute, with no increase in Contract Price or Contract Time. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time;

**4.4.4** The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute; and

**4.4.5** The Contractor shall, in the event that a substitute is less costly than that specified, credit the District with one hundred percent (100%) of the net

difference between the substitute and the originally specified material. In this event, the Contractor agrees to execute a deductive Change Order to reflect that credit.

**4.5** In the event Contractor furnishes a material, process, or article more expensive than that specified, the difference in the cost of that material, process, or article so furnished shall be borne by Contractor.

**4.6** In no event shall the District be liable for any increase in Contract Price or Contract Time due to any claimed delay in the evaluation of any proposed substitute or in the acceptance or rejection of any proposed substitute.

**4.7** Contractor shall be responsible for any costs the District incurs for professional services, DSA fees, or delay to the Project Schedule, if applicable, while DSA reviews changes for the convenience of Contractor and/or to accommodate Contractor's means and methods. District may deduct those costs from any amounts owing to the Contractor for the review of the request for substitution, even if the request for substitution is not approved. District, at its sole discretion, shall deduct from the payments due to and/or invoice Contractor for all the professional services and/or DSA fees or delay to the Project Schedule, if applicable, while DSA reviews changes for the convenience of Contractor and/or to accommodate Contractor's means and methods arising herein.

## **5. Weather Days**

Delays due to Adverse Weather conditions will only be permitted in compliance with the provisions in the General Conditions and only if the number of days of Adverse Weather exceeds the following parameters and Contractor can verify that the excess days of Adverse Weather caused delays:

January	<u><b>3</b></u>	July	<u><b>0</b></u>
February	<u><b>2</b></u>	August	<u><b>0</b></u>
March	<u><b>2</b></u>	September	<u><b>0</b></u>
April	<u><b>1</b></u>	October	<u><b>0</b></u>
May	<u><b>1</b></u>	November	<u><b>1</b></u>
June	<u><b>0</b></u>	December	<u><b>2</b></u>

**6. Owner-Controlled or Wrap-Up Insurance Program (NOT USED)**

Contractor and all Subcontractors under the Contractor shall participate in and comply with the owner-controlled or wrap-up insurance program ("OCIP"). In addition, Contractor shall procure and maintain, at its own expense, until completion and final acceptance of the Work at least the following insurance from insurance companies with an A.M. Best rating of no less than \_\_\_\_\_, except for those coverages provided by the OCIP as described in the OCIP Manual:

<b><del>{Commercial General Liability}</del></b>	Personal Injury Liability, Broad Form Property Damage including completed operations, and Explosion, Collapse and Underground Hazards	<b><del>{E.G. \$5,000,000}</del></b>
<b><del>{Automobile Liability—Any Auto}</del></b>	Bodily Injury and Property Damage	<b><del>{E.G. \$5,000,000}</del></b>
<b><del>{Workers Compensation}</del></b>		Statutory limits pursuant to State law
<b><del>{Employers' Liability}</del></b>		<b><del>{E.G. \$1,000,000}</del></b>

## 7. Insurance Policy Limits

All of Contractor's insurance shall be with insurance companies with an A.M. Best Rating of no less than A:VII. The limits of insurance shall not be less than:

<b>Commercial General Liability</b>	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	Low Risk: \$1,000,000 per occurrence; \$2,000,000 aggregate
		Intermediate Risk: \$2,000,000 per occurrence; \$4,000,000 aggregate
		High Risk: \$5,000,000 per occurrence; \$10,000,000 aggregate
<b>Automobile Liability – Any Auto</b>	Combined Single Limit	Personal vehicles: \$500,000 Commercial vehicles: \$1,000,000
		Personal vehicles: \$100,000 per person/ \$300,000 per accident
<b>Workers' Compensation</b>		Statutory limits pursuant to State law
<b>Employers' Liability</b>		<b>\$0</b>
<b>Builder's Risk (Course of Construction)</b>		Issued for the value and scope of Work indicated herein.
<b>Pollution Liability</b>		<b>\$0</b>

## 8. Permits, Certificates, Licenses, Fees, Approvals

**8.1** Payment for Permits, Certificates, Licenses, Fees, and Approvals. As required in the General Conditions, the Contractor shall secure and pay for all permits, licenses, approvals, and certificates necessary for the prosecution of the Work with the exception of the following:

### **8.1.1 N/A**

With respect to the above-listed items, Contractor shall be responsible for securing such items; however, District will be responsible for payment of these charges or fees. Contractor shall notify the District of the amount due with respect to such

items and to whom the amount is payable. Contractor shall provide the District with an invoice and receipt with respect to such charges or fees.

## **8.2 General Permit For Storm Water Discharges Associated With Construction and Land Disturbance Activities**

**8.2.1** Contractor acknowledges that all California school districts are obligated to develop and implement the following requirements for the discharge of storm water to surface waters from its construction and land disturbance activities (storm water requirements), without limitation:

**8.2.1.1** Municipal Separate Storm Sewer System (MS4) is a system of conveyances used to collect and/or convey storm water, including, without limitation, catch basins, curbs, gutters, ditches, man-made channels, and storm drains.

**8.2.1.2** Storm Water Pollution Prevention Plan ("SWPPP") contains specific best management practices ("BMPs") and establishes numeric effluent limitations at:

**8.2.1.2.1** Sites where the District engages in maintenance (e.g., fueling, cleaning, repairing) for transportation activities.

**8.2.1.2.2** Construction sites where:

**8.2.1.2.2.1** One (1) or more acres of soil will be disturbed, or

**8.2.1.2.2.2** The project is part of a larger common plan of development that disturbs more than one (1) acre of soil.

**8.2.2** Contractor shall comply with any District storm water requirements that are approved by the District and applicable to the Project, at no additional cost to the District.

**8.2.3** At no additional cost to the District, Contractor shall provide a Qualified Storm Water Practitioner who shall be onsite and implement and monitor any and all SWPPP requirements applicable to the Project, including but not limited to:

**8.2.3.1** At least forty eight (48) hours prior to a forecasted rain event, implementing the Rain Event Action Plan (REAP) for any rain event requiring implementation of the REAP, including any erosion and sediment control measures needed to protect all exposed portions of the site; and

**8.2.3.2** Monitoring any Numeric Action Levels (NALs), if applicable.

## **9. Project Labor Agreement/Payroll Records (NOT USED)**

The District has entered into a Project Labor Agreement ("PLA"), which covers this Project. Accordingly, ~~the following provision is added as Section 26.4.6:~~

~~**26.4.6** As Contractor and its subcontractors have agreed to be bound by the terms of the PLA entered into by the District [on or about / dated ] \_\_\_\_\_, Contractor and its subcontractors may be excused from uploading CPRs electronically~~

~~using DIR's eCPR System by upTBDloading the CPRs by electronic XML file or entering each record manually using the DIR's iform (or current form) online at <http://www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html>, or by using a more current application and URL. However, within ten (10) days of any request by the District or Labor Commissioner, Contractor and its subcontractors shall provide CPRs showing the name, address, social security number, work classification, straight time, and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by the Contractor and/or each subcontractor in connection with the Work.~~

## **10. As-Builts and Record Drawings**

**10.1** When called for by Division 1, Contractor shall submit As-Built Drawings pursuant to the Contract Documents consisting of one set of computer-aided design and drafting ("CADD") files in the following format TBD, plus one set of As-Built Drawings on vellum or mylar.

**10.2** Contractor shall submit Record Drawings pursuant to the Contract Documents consisting of one set of computer-aided design and drafting ("CADD") files in the following format TBD, plus one set of Record Drawings on vellum or mylar].

## **11. Fingerprinting**

Contractor shall comply with the provisions of Education Code section 45125.2 regarding the submission of employee fingerprints to the California Department of Justice and the completion of criminal background investigations of its employees, its subcontractor(s), and its subcontractors' employees. Contractor shall not permit any employee to have any contact with District pupils until such time as Contractor has verified in writing to the governing board of the District, that such employee has not been convicted of a violent or serious felony, as defined in Education Code section 45122.1. Contractor shall fully complete and perform all tasks required pursuant to the Criminal Background Investigation/ Fingerprinting Certification.

## **12. Disabled Veteran Business Enterprises**

This Project uses or may plan to use funds allocated pursuant to the State of California School Facility Program ("Program") for the construction and/or modernization of school buildings. Therefore, Section 17076.11 of the Education Code requires the District to have a participation goal for disabled veteran business enterprises ("DVBE") of at least three percent (3%), per year, of the overall dollar amount expended each year by the District on projects that receive state funding. The Contractor must submit the Disabled Veteran Business Enterprise Participation Certification to the District with its executed Agreement, identifying the steps Contractor took to solicit DVBE participation in conjunction with this Contract.

## **13. Construction Manager**

The District will use a Construction Manager on the Project that is the subject of this Contract. Ryan Lancaster is the Construction Manager for this Project.

**14. Program Manager**

Vickie Brum is the Program Manager designated for the Project that is the subject of this Contract.

**15. Federal Funds**

As this Project is funded in whole or in part by federal funds, Contractor and all Subcontractors are subject to civil or criminal prosecution for any violation of the federal False Claims Act set forth under section 1001 of title 18 and section 231 of title 31 of the United States Code.

**16. Preliminary Schedule of Values**

The preliminary schedule of values shall include, at a minimum, the following information and the following structure:

Replace provision in the General Conditions with the following provisions:

**16.1.1.2.3.** The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

**16.1.2.3.1** Mobilization and layout combined to equal not more than **1%**;

**16.1.1.2.3.2** Submittals, samples and shop drawings combined to equal not more than **3%**;

**16.1.1.2.3.3** Bonds and insurance combined to equal not more than **2%**.

END OF DOCUMENT

**HAZARDOUS MATERIALS**  
**PROCEDURES & REQUIREMENTS**

**1. Summary**

This document includes information applicable to hazardous materials and hazardous waste abatement.

**2. Notice of Hazardous Waste or Materials**

- a. Contractor shall give notice in writing to the District, the Construction Manager, and the Architect promptly, before any of the following materials are disturbed, and in no event later than twenty-four (24) hours after first observance, of any:
  - (1) Material that Contractor believes may be a material that is hazardous waste or hazardous material, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law;
  - (2) Other material that may present a substantial danger to persons or property exposed thereto in connection with Work at the site.
- b. Contractor's written notice shall indicate whether the hazardous waste or material was shown or indicated in the Contract Documents to be within the scope of Work, and whether the materials were brought to the site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible. As used in this section the term "hazardous materials" shall include, without limitation, asbestos, lead, Polychlorinated biphenyl (PCB), petroleum and related hydrocarbons, and radioactive material.
- c. In response to Contractor's written notice, the District shall investigate the identified conditions.
- d. If the District determines that conditions do not involve hazardous materials or that no change in terms of Contract is justified, the District shall so notify Contractor in writing, stating reasons. If the District and Contractor cannot agree on whether conditions justify an adjustment in Contract Price or Contract Time, or on the extent of any adjustment, Contractor shall proceed with the Work as directed by the District.
- e. If after receipt of notice from the District, Contractor does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume Work under special conditions, then District may order such portion of Work that is in connection with such hazardous condition or such affected area to be deleted from the Work, or performed by others, or District may invoke its rights to terminate the Contract in whole or in part. District will determine entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Time as a result of deleting such portion of Work, or performing the Work by others.



- f. If Contractor stops Work in connection with any hazardous condition and in any area affected thereby, Contractor shall immediately redeploy its workers, equipment, and materials, as necessary, to other portions of the Work to minimize delay and disruption.

### **3. Additional Warranties and Representations**

- a. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have the required levels of familiarity with the Site and the Work, training, and ability to comply fully with all applicable laws and contractual requirements for safe and expeditious performance of the Work, including whatever training is or may be required regarding the activities to be performed (including, but not limited to, all training required to address adequately the actual or potential dangers of Contract performance).
- b. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have and maintain in good standing any and all certifications and licenses required by applicable federal, state, and other governmental and quasi-governmental requirements applicable to the Work.
- c. Contractor represents and warrants that it has studied carefully all requirements of the Specifications regarding procedures for demolition, hazardous waste abatement, or safety practices, specified in the Contract, and prior to submitting its bid, has either (a) verified to its satisfaction that the specified procedures are adequate and sufficient to achieve the results intended by the Contract Documents, or (b) by way of approved "or equal" request or request for clarification and written Addenda, secured changes to the specified procedures sufficient to achieve the results intended by the Contract Documents. Contractor accepts the risk that any specified procedure will result in a completed Project in full compliance with the Contract Documents.

### **4. Monitoring and Testing**

- a. District reserves the right, in its sole discretion, to conduct air monitoring, earth monitoring, Work monitoring, and any other tests (in addition to testing required under the agreement or applicable law), to monitor Contract requirements of safe and statutorily compliant work methods and (where applicable) safe re-entry level air standards under state and federal law upon completion of the job, and compliance of the work with periodic and final inspection by public and quasi-public entities having jurisdiction.
- b. Contractor acknowledges that District has the right to perform, or cause to be performed, various activities and tests including, but not limited to, pre-abatement, during abatement, and post-abatement air monitoring, that District shall have no obligation to perform said activities and tests, and that a portion of said activities and tests may take place prior to the completion of the Work by Contractor. In the event District elects to perform these activities and tests, Contractor shall afford District ample access to the Site and all areas of the Work as may be necessary for the performance of these activities and tests. Contractor will include the potential impact of these

activities or tests by District in the Contract Price and the Scheduled Completion Date.

- c. Notwithstanding District's rights granted by this paragraph, Contractor may retain its own industrial hygiene consultant at Contractor's own expense and may collect samples and may perform tests including, but not limited to, pre-abatement, during abatement, and post-abatement personal air monitoring, and District reserves the right to request documentation of all such activities and tests performed by Contractor relating to the Work and Contractor shall immediately provide that documentation upon request.

## **5. Compliance with Laws**

- a. Contractor shall perform safe, expeditious, and orderly work in accordance with the best practices and the highest standards in the hazardous waste abatement, removal, and disposal industry, the applicable law, and the Contract Documents, including, but not limited to, all responsibilities relating to the preparation and return of waste shipment records, all requirements of the law, delivering of all requisite notices, and obtaining all necessary governmental and quasi-governmental approvals.
- b. Contractor represents that it is familiar with and shall comply with all laws applicable to the Work or completed Work including, but not limited to, all federal, state, and local laws, statutes, standards, rules, regulations, and ordinances applicable to the Work relating to:
  - (1) The protection of the public health, welfare and environment;
  - (2) Storage, handling, or use of asbestos, PCB, lead, petroleum based products, radioactive material, or other hazardous materials;
  - (3) The generation, processing, treatment, storage, transport, disposal, destruction, or other management of asbestos, PCB, lead, petroleum, radioactive material, or hazardous waste materials or other waste materials of any kind; and
  - (4) The protection of environmentally sensitive areas such as wetlands and coastal areas.

## **6. Disposal**

- a. Contractor has the sole responsibility for determining current waste storage, handling, transportation, and disposal regulations for the job Site and for each waste disposal facility. Contractor must comply fully at its sole cost and expense with these regulations and any applicable law. District may, but is not obligated to, require submittals with this information for it to review consistent with the Contract Documents.
- b. Contractor shall develop and implement a system acceptable to District to track hazardous waste from the Site to disposal, including appropriate "Hazardous Waste Manifests" on the EPA form, so that District may track the volume of waste it put in each landfill and receive from each landfill a certificate of receipt.

- c. Contractor shall provide District with the name and address of each waste disposal facility prior to any disposal, and District shall have the express right to reject any proposed disposal facility. Contractor shall not use any disposal facility to which District has objected. Contractor shall document actual disposal or destruction of waste at a designated facility by completing a disposal certificate or certificate of destruction forwarding the original to the District.

## **7. Permits**

- a. Before performing any of the Work, and at such other times as may be required by applicable law, Contractor shall deliver all requisite notices and obtain the approval of all governmental and quasi-governmental authorities having jurisdiction over the Work. Contractor shall submit evidence satisfactory to District that it and any disposal facility:
  - (1) have obtained all required permits, approvals, and the like in a timely manner both prior to commencement of the Work and thereafter as and when required by applicable law; and
  - (2) are in compliance with all such permits, approvals and the regulations.

For example, before commencing any work in connection with the Work involving asbestos-containing materials, or PCBs, or other hazardous materials subject to regulation, Contractor agrees to provide the required notice of intent to renovate or demolish to the appropriate state or federal agency having jurisdiction, by certified mail, return receipt requested, or by some other method of transmittal for which a return receipt is obtained, and to send a copy of that notice to District. Contractor shall not conduct any Work involving asbestos-containing materials or PCBs unless Contractor has first confirmed that the appropriate agency having jurisdiction is in receipt of the required notification. All permits, licenses, and bonds that are required by governmental or quasi-governmental authorities, and all fees, deposits, tap fees, offsite easements, and asbestos and PCB disposal facilities expenses necessary for the prosecution of the Work, shall be procured and paid for by Contractor. Contractor shall give all notices and comply with the all applicable laws bearing on the conduct of the Work as drawn and specified. If Contractor observes or reasonably should have observed that Plans and Specifications and other Contract Documents are at variance therewith, it shall be responsible for promptly notifying District in writing of such fact. If Contractor performs any Work contrary to applicable laws, it shall bear all costs arising therefrom.

- b. In the case of any permits or notices held in District's name or of necessity to be made in District's name, District shall cooperate with Contractor in securing the permit or giving the notice, but the Contractor shall prepare for District review and execution upon approval, all necessary applications, notices, and other materials.

**8. Indemnification**

To the fullest extent permitted by law, the indemnities and limitations of liability expressed throughout the Contract Documents apply with equal force and effect to any claims or liabilities imposed or existing by virtue of the removal, abatement, and disposal of hazardous waste. This includes, but is not limited to, liabilities connected to the selection and use of a waste disposal facility, a waste transporter, personal injury, property damage, loss of use of property, damage to the environment or natural resources, or "disposal" and "release" of materials associated with the Work (as defined in 42 U.S.C. § 9601 *et seq.*).

**9. Termination**

District shall have an absolute right to terminate for default immediately without notice and without an opportunity to cure should Contractor knowingly or recklessly commit a material breach of the terms of the Contract Documents, or any applicable law, on any matter involving the exposure of persons or property to hazardous waste. However, if the breach of contract exposing persons or property to hazardous waste is due solely to an ordinary, unintentional, and non-reckless failure to exercise reasonable care, then the procedures for termination for cause shall apply without modification.

END OF DOCUMENT



# Project Manual

## Parklane Elementary School - HVAC Replacement

**Lodi Unified School District**

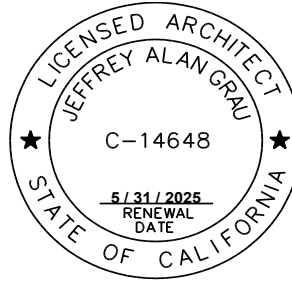
**Lodi, California**

**Job Number 3431004**

**September 22, 2023**

**Architect**

Rainforth Grau Architects  
2101 Capitol Avenue, Suite 100  
Sacramento, CA 95816  
916.368.7990



**Structural Engineer**

RW Consulting Engineers, Inc.  
1450 Harbor Blvd., Suite F  
Sacramento, CA 95691  
(916) 716-6910

**Mechanical Engineer**

Capital Engineering Consultants  
11020 Sun Center Drive, Suite 100,  
Rancho Cordova, CA 95670  
(916) 851-3500 Fax (916) 631-4424

**Electrical Engineer**

Capital Engineering Consultants  
11020 Sun Center Drive, Suite 100,  
Rancho Cordova, CA 95670  
(916) 851-3500 Fax (916) 631-4424

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Work included.
  - 2. Work by others.
  - 3. Dimensional tolerances for accessibility.
  - 4. Contractor's use of premises.
  - 5. Work sequence.
  - 6. Owner occupancy.
  - 7. Existing utilities.
  - 8. Asbestos.

**1.2 WORK INCLUDED**

- A. Under a single contract construct the Parklane Elementary School - HVAC Replacement, Lodi Unified School District located in Stockton, CA. Work includes:
  - 1. Removal of existing HVAC units at Buildings A and B, including all electrical and gas connections.
  - 2. Installation of new HVAC units.
  - 3. New platforms for condensing units, including roofing and waterproofing.
  - 4. Controls as shown.
  - 5. Other work as shown in the documents and as required for a complete an operational project.

**1.3 WORK BY OTHERS**

- A. Work on the Project which will be executed prior to start of Work of this Contract, and which is excluded from this Contract, is as follows:
  - 1. Owner will remove furniture, supplies, drapes and salvageable items. Owner will not remove finishes or expose structure in support of Contractor's work.
- B. Work in the Project which will be executed after completion of Work of this Contract, and which is excluded from this Contract, as follows:
  - 1. None
- C. Work on this Project which will be executed during the Work of this Contract which the Contractor shall coordinate with and facilitate:
  - 1. None

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**1.4 DIMENSIONAL TOLERANCES FOR ACCESSIBILITY**

- A. While it is recognized that construction practices generally permit a level of reasonable dimensional tolerance, the installation of any items subject to compliance with the Americans with Disabilities Act Accessibility Guidelines and Chapter 11B of the California Building Code (CBC), which are not shown with dimensional tolerances, on the drawings or in the CBC, shall be considered absolute. These dimensions will be strictly enforced. Items found to be out of tolerance may require modification and/or replacement at contractor's expense.

**1.5 CONTRACTOR'S USE OF PREMISES**

- A. Specific roads for access to and from building sites will be agreed on with the Owner. All traffic and materials delivery shall be confined to these roads.
- B. Specific areas for storage of materials and site fabrication will be agreed upon. Contractor's activities shall be confined to these areas.
- C. Work shall proceed in such manner as to not interfere with Owner's activities in and about nearby facilities. Exceptions will be made only after previous agreement between Owner, Architect and Contractor.
- D. Fire alarm, intercom, intrusion alarm and other such tests shall be conducted outside of school hours and shall be coordinated with site personnel, if such tests occur after occupancy.

**1.6 WORK SEQUENCE**

- A. Schedule and construct work in stages to accommodate Owner's use of the premises before and after the primary construction period. Coordinate the construction schedule and operations with the Owner's representative. The three stages of the construction process following the bid award shall be:
  - 1. Pre-construction Stage: Pre-construction activities shall occur from the start date, to the first day of availability. Activities shall include, but are not limited to:
    - a. Project scheduling/subcontractor coordination
    - b. Identification of long lead materials and equipment
    - c. Temporary facilities and controls
    - d. Action submittals as specified, including:
      - 1) Shop drawing submittals
    - e. Material ordering (particularly long lead items)
    - f. Material stock piling
    - g. Field measuring
    - h. The architect and engineers will expedite all long lead item submittals as quickly as possible. Such items must be indicated as "critical" when submitted. Substitutions of finishes, materials and equipment will not be permitted due to the lack of availability unless submittals are made early and completely.

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2. Construction Stage: Primary construction activities shall occur from the date of availability, through the Date of Substantial Completion. Activities shall include work as described by the construction documents.
    - a. It is the intention of the owner to make these buildings available on the dates indicated below. Certain units also may be available earlier than the dates shown.
    - b. Due to the nature of the work and the type of facilities, the schedule is fixed and cannot be altered. The premises will not be available prior to date of availability. All primary work must be completed prior to Date of Substantial Completion. Critical work, includes life safety, HVAC, plumbing, electrical service, security and general construction. Temporary measures will be required if primary work is uncompleted at start of school date.
    - c. As the Owner needs time for preparing classrooms for the new school session, the Contractor shall turn over spaces in an orderly sequence to allow occupancy and use of the spaces over the final 2 weeks of the construction period. This schedule must be prepared with the Owner's input.
  3. Completion/Close-out Stage: Completion and close-out activities shall occur from Date of Substantial Completion to Final Completion. Activities shall include:
    - a. Completion of minor finish work. Minor work shall be considered completion or installation of items which will not interfere or hinder the Owner from utilizing the facility, such as touch-up painting, hardware adjustment, etc.
    - b. Punch list work.
    - c. Project close-out.
    - d. All work performed during this period must occur outside of normal school hours. Arrangements must be made with the owner representative and work schedules approved.
- B. Delays:
1. Minor delays: Minor delays caused by parties other than the Contractor, such as the Owner or Architect will not be considered critical path delays and will not result in a time extension to the project schedule. Minor delays shall be defined as delays due to the need for review, clarifications, consideration, detailing, etc. which typically do not last more than 48 hours, are addressed promptly and solved without significant changes to the work, as determined solely by the Architect. Such items which may cause delay must be identified by the Contractor at the time of origin.
  2. Other delays: Other delays caused by unknown or unforeseen conditions or significant changes or modifications requested by or required by the Owner, Architect or DSA, will be permitted only if promptly submitted, reviewed and approved by the Architect and Owner. Such delays may result in time extensions to specific work or areas of work only, and not to other unaffected portions of the project. Such delays must directly affect the critical path of the work, be shown as unavoidable and be unable to be made up through rescheduling.
- C. Occupancy: The project will be occupied by the School Staff as shown below. Dates are fixed and cannot be changed. The premises will be occupied whether or not the work is completed regardless of time extensions (if any). Any work performed after this

**SUMMARY OF WORK**  
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date will need to be fully coordinated with the Owner and will be limited to after school hours or weekends.

**D. Project Schedule:**

1. The following schedule summarizes the major activity dates (Dates are approximate and actual start dates are subject to change):

a.	Bid	Dates
	1) Advertise to Bid (first)	October 10, 2023
	2) Advertise to Bid (second)	October 17, 2023
	3) Pre-Bid Conference	October 19, 2023
	4) Addendum (last)	October 26, 2023
	5) Bids Due	October 30, 2023
	6) Board Award	November 7, 2023
b.	Contracts	
	1) Bond Preparation	November 8 - 15, 2023
	2) Contract Execution	November 16, 2023
c.	Pre-Construction Activities	
	1) Start Date	November 20, 2023
	2) Submittals and Approvals	Nov 20, 2023 - Jan 20, 2024
	3) Materials Ordering/Stockpiling	December 2023 - May 2024
	4) School Concludes for Summer	May 31, 2024
d.	Construction	
	1) Date of facility availability	June 1, 2024
	2) Construction, All Units	June 1, 2024 - July 23, 2024
	3) Begin turning over spaces to District	July 17, 2024
e.	Occupancy: In order to accommodate a phased occupancy by the Owner, the Contractor will turn the buildings over for occupancy as follows:	
	1) Occupancy - Staff	July 24, 2024
	2) Occupancy - Students	August 1, 2024
f.	Completion/Close-out	
	1) Substantial Completion Date	July 17, 2024
	2) Complete Minor Finish Work	July 31, 2024
	3) Complete Punch List Work	July 31, 2024
	4) Closeout/Completion	August 31, 2024

**1.7 OWNER OCCUPANCY**

- A. Owner will occupy nearby premises during construction.
- B. Refer to General Conditions for requirements for partial occupancy by Owner.
- C. Owner will not occupy buildings included in this scope of work during the primary construction period. However, occupancy will occur as shown above.

- D. Owner may occupy other buildings on premises during construction and may be present on site during summer construction period.

## **1.8 EXISTING UTILITIES**

- A. It is recognized by the District and the Contractor that the location of existing utility facilities as shown on contract drawings and specifications are approximate; their exact location is unknown.
- B. Recognition is given to the fact there may be additional utilities existing on the property unknown to either party to the Contract. Location of utilities as shown on drawings and specifications represent the best information obtainable from utility maps and other information furnished by the various agencies involved. The Owner warrants neither the accuracy nor the extent of actual installations as shown on the drawings and specifications.
- C. Because of this uncertainty, it may become necessary for the Architect to make adjustments in the line or grade of sewers or storm drains. Installation of such adjusted lines shall be made at the regular unit price bid for the work, and no additional compensation will be paid therefore, unless the scope and character of the work has been changed.
- D. The Contractor agrees and is required to coordinate and fully cooperate with the Owner and utility owners for the location, relocation, and protection of utilities. The Contractor's attention is directed to the existence of utilities, underground and overhead, necessary for all buildings within the area of work. Prior to start of trenching operations, the Contractor shall meet with Owner Representative(s) to fully review known utility locations which may affect the work.
- E. In accordance with Section 4215 of the Government Code of the State of California, the Owner shall make provisions to compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating such main and trunk line utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work. Compensation will be in accordance with the provisions of these specifications providing for change orders. Nor shall the Contractor be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the Owner or owner of the utility to provide for removal or relocation of such utility facilities.
- F. Nothing herein shall be deemed to require compensation to the Contractor or to relieve him from being assessed liquidated damages for such delay when the presence of unidentifiable utilities can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of construction, and the damage to existing utilities or delay was caused in whole or in part by a failure of the Owner to indicate the presence of such service laterals or appurtenances.
- G. In the event the Contractor discovers utilities not identified in the Contract plans or specifications, the Contractor shall immediately notify the Architect and the utility owner by the most expeditious means available and later confirm in writing.

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- H. Existing building utilities shall not be interrupted during normal operating hours.

**1.9 HAZARDOUS MATERIALS**

- A. Prior to start of work, the Contractor shall obtain and review the Owner's hazardous materials report on any existing facilities to become familiar with existing conditions.
- B. If asbestos or hazardous materials identified in the report are not fully addressed in the contract documents, the contractor shall bring this to the attention of the Architect prior to start of construction for clarification.
- C. Should asbestos or hazardous materials outside of the scope of work be discovered during construction operations, the contractor shall immediately notify the Project Inspector and Architect and shall suspend work in the area until necessary identification, testing and abatement (if required) is completed.

**END OF SECTION**

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*Last Updated: December 16, 2021*

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pre-construction Meeting.
  - 2. Regular project meetings.
  - 3. Pre-installation meetings.

**1.2 GENERAL**

- A. The Architect shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to the Owner, Project Inspector, Contractor, participants, and others affected by the decisions made.
- B. Attendance required: Project Superintendent, Project Manager (if any), major Subcontractors (as requested), Architect, Project Inspector, and others as appropriate to the meeting topics.

**1.3 PRE-CONSTRUCTION MEETING**

- A. Upon issuing a notice of intent to award the contract, the Architect will schedule a pre-construction meeting.
- B. Agenda: Architect and Contractor shall prepare an agenda and distribute copies at least one week in advance of the Pre-Construction meeting.
- C. Architect's agenda may include, but not limited to, discussion of the following items:
  - 1. Project description and scope of work.
  - 2. Accepted alternates.
  - 3. Temporary facilities and use of the site.
  - 4. Environmental procedures.
  - 5. Hazardous materials and abatement
  - 6. Legal and code requirements.
  - 7. Designation of personnel representing the parties to the contract; lines of communication.
  - 8. Communication and responsibilities.
  - 9. Submittal procedures in accordance with Section 01 3300.
  - 10. Construction schedule and critical path.
  - 11. Schedule of values.
  - 12. Record drawings.
  - 13. Progress payments.
  - 14. Change orders and time extensions (related to critical path).
  - 15. Inspection and testing.

**PROJECT MEETINGS**  
**SECTION 01 3119**  
**3431004**

16. Project closeout.

**1.4 PROJECT MEETINGS**

- A. The Architect will schedule and run weekly or bi-weekly project meetings throughout the project to review the short-term project schedule and to discuss issues requiring resolution. It is the duty of the Contractor to attend, participate in, and comply with the agreements reached and direction set at these meetings.

**1.5 MONTHLY MEETINGS**

- A. The Architect shall schedule and run monthly meetings for the purpose of assessing progress, approving payment, resolving problems, and addressing mid-range and long-range scheduling issues.

**1.6 PRE-INSTALLATION MEETINGS**

- A. The Contractor shall schedule and run pre-installation meetings in accordance with the product specifications.

**1.7 SPECIAL MEETINGS**

- A. The Architect may occasionally schedule special meetings for the purpose of discussing work requiring a significant coordination effort or for resolving issues which require more attention than they can be given in the regularly scheduled meetings. The Contractor shall attend these meetings along with representatives of subcontractors, suppliers, and/or manufacturers when appropriate for the subject matter to be discussed.

**END OF SECTION**

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*Last Updated: December 16, 2021*



SUBMITTAL NO.:

Architect's Project # \_\_\_\_\_

DATE: \_\_\_\_\_

DSA File/Apl. # \_\_\_\_\_

Re-Submittal of Original No.: \_\_\_\_\_

## 1. SUBMITTAL TRANSMITTAL

Attention:

Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_

Sub Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_



**Please submit only one trade per submittal! Description of submitted materials:**

Quantity submitted	Specification Section		Description of contents (e.g. product data, shop drawings, samples)
	Section #	Section Title	

**Contractor Statement: (read and acknowledge)**

This submittal has been reviewed and approved with respect to the means, methods, techniques, and procedures of construction, safety precautions, and program incidentals thereto. This submittal complies with the contract documents and comprises no variations thereto, unless accompanied by a substitution request.

By: \_\_\_\_\_  
Name

Date: \_\_\_\_\_

## 2. RE-TRANSMITTAL TO CONTRACTOR:

Distribution: Contractor, Owner, Project Inspector, RGA, Other

NO EXCEPTIONS TAKEN  
SUBMIT SPECIFIED ITEM

REJECTED  
REVISE AND RESUBMIT

FURNISH AS CORRECTED  
NO ACTION REQUIRED

Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the Drawings and Specifications. This general check is only for the review of conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all the other trades, and performing his work in a safe and satisfactory manner.

**Rainforth Grau Architects**

By: \_\_\_\_\_

Date: \_\_\_\_\_

**Additional Comments:**

See Specification Section 01 3300 for use of this form

**SUBSTITUTION  
REQUEST NO.:**

Architect's Project #  
DSA File/Appl. #

Date: \_\_\_\_\_

**1. SUBSTITUTION REQUEST**

Attention:

Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_



***Please submit only one product per request!***

Sub Contractor: \_\_\_\_\_

***Include with a specified product Submittal***

Contact: \_\_\_\_\_

**2. PROPOSED SUBSTITUTIONS: The undersigned requests consideration of the following substitution:**

Specified Item: \_\_\_\_\_ Page No.: \_\_\_\_\_ Paragraph No.: \_\_\_\_\_

Proposed Item: \_\_\_\_\_

**3. REASON FOR REQUEST:****4. REQUIREMENTS FOR SUBSTITUTIONS:**

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified. Attached data also includes a description of changes to Contract Documents, which proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on drawings and does not require design changes in the Contract Documents.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on the work, the schedule or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the proposed substitution are equivalent or superior to the specified item.

\_\_\_\_\_  
Signature - Contractor/Subcontractor

\_\_\_\_\_  
Date

**5. TRANSMITTAL TO CONTRACTOR:**

Distribution: Contractor, Owner, Project Inspector, RGA, Other

**ACCEPTED**

**ACCEPTED AS NOTED**

**REJECTED**

**Rainforth Grau Architects**

By: \_\_\_\_\_

Date: \_\_\_\_\_

**Comments:**

RFI NO.:

Architect's Project #  
DSA File/Apl. #

Date: \_\_\_\_\_

**1. REQUEST FOR INFORMATION**

Attention:

From:

Contractor:

\_\_\_\_\_

Contact:

\_\_\_\_\_

Sub Contractor:

\_\_\_\_\_

Contact:

\_\_\_\_\_



**Identify related specific references within the Contract Documents and supporting information:**

Dwg./Document No.: \_\_\_\_\_

Building/Site Location: \_\_\_\_\_

**2. Existing Condition** (source / reason for the request):

**3. Recommended Contractor Action(s) for resolution:**

**4. Project Inspector Acknowledgment:**

Date Reviewed: \_\_\_\_\_

**5. Owner / A/E Resolution(s):**

Date of Response: \_\_\_\_\_ By: \_\_\_\_\_

*Attachments:* \_\_\_\_\_

*Extra Work Involved in the Above Described Change?*

Yes

No

Distribution: Contractor, Owner, Project Inspector, RGA, Other  
See Specification Section 01300 for use of this form

Architect's Project #  
DSA File/Appl. #

Date: \_\_\_\_\_

---

## 1. ELECTRONIC DATA REQUEST

Attention:



From: Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_

Sub Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_

---

## 2. DATA REQUESTED - Provide list of specific drawings requested (include sheet numbers):

---

## 3. REASON FOR REQUEST - Provide clear explanation of why information is desired and for what purpose it will be utilized:

---

## 4. ACKNOWLEDGEMENT OF RESPONSIBILITY:

The electronic data files requested are distributed for reference only. Transferring such files can alter, delete or change original information. Accuracy of the data cannot be guaranteed as correct or complete and the Contractor accepts full responsibility for any and all inaccuracies, regardless of cause.

The hard copy documents, including addenda and subsequent written changes to the documents, represent the complete work of the contract and all electronic files should be cross-referenced and verified from that information as electronic files may not contain all contract information. It is the Contractor's responsibility to make any changes or revisions necessary.

This electronic data is furnished without guarantee of compatibility with your hardware or software. It is the Contractor's responsibility to notify the Architect in the event a compatibility problem or disk defect is encountered and a replacement disk is necessary.

This electronic data, in its present form, remains the property of Rainforth Grau Architects and shall not be used for any other purpose than to provide background information for the project noted above. It is not to be released to any other party without the written consent of Rainforth Grau Architects.

Accepted by: \_\_\_\_\_  
Signature - Contractor/Subcontractor

Representing: \_\_\_\_\_  
Contractor/Subcontractor Company Name

### **MEGGER GROUNDING TEST CERTIFICATE**

This certifies that a Megger Grounding Test for the **Parklane Elementary School - HVAC Replacement** for the **Lodi Unified** School District, of **San Joaquin** County, California was conducted on the \_\_\_\_\_ day of \_\_\_\_\_, **2023**, per CCR Title 24, Sections 200 H and J. The undersigned verifies that the resistance to ground was 25 ohms or less, as required, and is found to be acceptable.

Project Name: \_\_\_\_\_

DSA File No.: \_\_\_\_\_ DSA Application No.: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Contractor's Signature: \_\_\_\_\_

Electrical Contractor's Signature: \_\_\_\_\_

Testing Agency's Signature: \_\_\_\_\_

District Inspector's Signature: \_\_\_\_\_

**SEPARATE CERTIFICATE IS REQUIRED FOR EACH SITE**

### **CERTIFICATION OF COMPLIANCE FOR BUILDING MATERIALS**

This is to certify, in accordance with the Environmental Protection Agency requirements, that the materials and equipment used in the construction of the **Parklane Elementary School - HVAC Replacement** for the **Lodi Unified** School District of **San Joaquin** County, California, are asbestos free and are, therefore, not subject to monitoring for asbestos contamination.

Project Name: \_\_\_\_\_

Address: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**SEPARATE CERTIFICATE IS REQUIRED FOR EACH SITE**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

A. Section Includes:

1. Requirements for the following:
  - a. Electronic Data Transfer.
  - b. Substitutions: Specific procedures for submission and approval of products other than those specified or noted on the Drawings.
  - c. Procedures for processing of Contractors "Requests for Interpretation" (RFI) questions.
2. Procedures to be followed in preparing and submitting the following:
  - a. Subcontractor List.
  - b. Progress Schedule.
  - c. Schedule of Values.
  - d. Shop Drawings.
  - e. Product Data/Material Lists.
  - f. Samples.
  - g. Requests for Information (RFI).
  - h. Record Drawings.
  - i. Certifications including those required for material VOC content.
  - j. Maintenance/Operating Manuals.
  - k. Warranties and Extended Guarantees.
  - l. Extra Stock.
3. Substitution Procedures: Specific requirements for submission and approval of products other than those specified or noted on the Drawings.
4. Procedures for processing of Contractors "Requests for Interpretation" (RFI) questions.
5. Electronic Data Transfer.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions; "Accessory Material VOC Content Certification Form."
- B. Section 01 7700, Closeout Procedures.
- C. Section 01 7836, Warranties; guarantee/warranty forms.
- D. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.
- E. Test reports: Pertinent Specification Sections (by testing lab).

## **SUBMITTAL PROCEDURES**

### **SECTION 01 3300**

**3431004**

- F. Individual requirements for submittals also are described in other Sections of these Specifications.

#### **1.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples indicated in individual Specification Sections as informational submittals that do not require Architect's responsive action.
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. General;
  - 1. Shop drawings, product data, and samples are in no case to be considered Contract Documents but are to be treated only as instruments of convenience and facility to further the progress of the Work.
  - 2. Miscellaneous systems not specifically specified but installed to meet code requirements or for other reasons are subject to Architect's review prior to installation.
- B. Shop drawings, product data, samples and supporting data shall be prepared by Contractor or its suppliers but shall be submitted to Architect by Contractor as the instruments of the Contractor.
- C. Coordination of Submittals:
  - 1. Before submitting a shop drawing or any related material to Architect, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, which are the sole responsibility of the Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. By affixing the Contractor's signature to each submittal, the Contractor certifies that this coordination has been performed.
  - 2. Architect shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Architect otherwise via a written instrument which is acknowledged by the Architect in writing.
- D. Grouping of Submittals:
  - 1. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.



2. Partial submittals may be rejected as not complying with the provisions of the Contract. The Contractor may be held liable for delays so occasioned.
- E. Architect will check submittals for conformance with design concepts of project. Approval by Architect covers only such conformance. Effort will be made by Architect to discover any errors, but responsibility for accuracy and correctness of submittals shall be with the Contractor.
- F. Approval of submittals will be on a general basis only and shall not relieve the Contractor from their responsibility for proper fitting and construction of the Work, nor from furnishing materials and labor required by the Contract which may not be indicated on the submittals when approved.
- G. No portion of the work requiring submittals shall be commenced until the submittal for that portion of the work has been approved by Architect. All such portions of work shall be in accordance with the approved submittals. Any work performed without approved submittals will be done so at the Contractor's own risk. Work found not to be in compliance with the approved submittals shall be removed and corrected at the Contractor's own expense.
- H. The Contractor shall make corrections required by Architect and shall resubmit as required by Architect the required number of corrected copies of shop drawings, product data, or new samples until approved. Contractor shall direct specific attention in writing or on resubmittals to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than two (2) re-reviews of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor.

#### **1.5 ELECTRONIC DATA TRANSFER**

- A. Requests for Electronic Data will be considered upon receipt of written request by the Contractor accompanied by a signed copy of the Electronic Data Request Form (included with this section). Request should clearly outline specific Drawings desired and the intent of the request.
  1. Submit Electronic Data Request Form on standard form.
  2. Allow 72 hours minimum for review and consideration by Architect.
- B. Electronic data files are not a part of the contract documents, but rather a convenience for the Contractor in preparation of his required submittals and layout efforts. Electronic files do not alter the content or meaning of the hard copy documents which may be a part of the Contract Documents.
- C. The electronic data files will remain the property of the Architect, shall not be used for any other purpose than that purpose stated in the Electronic Data Request Form, and shall not be released by the Contractor or any subcontractor to any other party without written consent from the Architect.
- D. The electronic data files are distributed for reference only. Transferring such files can alter, delete or change original information. Accuracy of the data cannot be guaranteed

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as correct or complete and the Contractor accepts full responsibility for inaccuracies, regardless of cause.

- E. The hard copy documents, including addenda and subsequent written changes to the documents, represent the complete work of the Contract. Electronic files should be cross-referenced to the Contract Documents by the user and verified from that the information included contains the necessary Contract information. It is the Contractor's responsibility to make any changes or revisions to the electronic data files as necessary.
- F. Architect may, at his complete discretion and without explanation, approve or deny requests for electronic data.

**1.6 SUBSTITUTIONS**

- A. Architect's Approval Required:
  - 1. Contract is based on materials, equipment and methods described in Contract Documents. Substitutions will not be reviewed and approved prior to the award of the contract.
  - 2. Architect will consider proposals during the submittal process for substitution of materials, equipment and methods only when such proposals are accompanied by full and complete technical data and other information required by Architect to evaluate proposed substitution. Substitution shall be submitted with completed Substitution Request Form, included with this section.
  - 3. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this work by Architect.
- B. "Or Equal": Whenever, in Contract Documents, any material, process or specified patent or proprietary name and/or by name of manufacturer is indicated, such name shall be deemed to be used for purpose of facilitating description of material and/or process desired, and shall be deemed to be followed by the words "or equal" and Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor shall furnish material, process or article specified or one that in opinion of Architect is equal thereof in every respect.
- C. "No Substitutions": Items indicated as "No Substitutions" shall be provided as specified and no alternates will be allowed. These items are required either due to standards implemented by the Owner or to match materials recently installed by others.
- D. Coordination: Approval of substitution shall not relieve Contractor from responsibility for compliance with requirements of Drawings and Project Manual, and Contractor shall be responsible at his own expense for any changes in other parts of its own work or work of others which may be caused by approved substitution.
- E. DSA Approval: Substitutions of certain items may cause such items to require a Deferred Approval by DSA. Should a DSA Deferred Approval be required, the Contractor shall provide information and documents necessary to complete the Deferred Approval process without any additional costs to the Owner, including engineering, calculation and modification of substitute products.

## **PART 2 - SUBMITTALS**

### **2.1 SUBCONTRACTOR LIST**

- A. Provide a typed list of Subcontractors within 5 days of notice of the award of contract. Include Subcontractor name, address, phone number, license number and trade.

### **2.2 PROGRESS SCHEDULE**

- A. Prepare and submit estimated progress schedule for work within 10 calendar days after issuance of Notice to Proceed. Submit up-dated schedules:
  - 1. At mid-point of construction.
  - 2. When time extensions of more than two weeks are necessary.
- B. Relate progress Schedule to entire Project. Indicate following:
  - 1. Dates for starting and completion of various sub-contracts.
  - 2. Dates for submission of required submittals.

### **2.3 SCHEDULE OF VALUES**

- A. Before first Application for Payment, submit for Architect's approval a Schedule of Values of various portions of work, aggregating total Contract sum, divided so as to facilitate payment to subcontractors, prepared in such form as Architect and Contractor may agree upon, and supported by such data to substantiate its correctness as Architect may require.
  - 1. Breakdown shall include separation of sitework from building work for main categories including electrical, plumbing, concrete, etc. Separations shall also be provided for each building of a multiple building contract. Include proper share of overhead and profit with each item in Schedule of Values.
  - 2. This Schedule, when approved by Architect, shall be used as basis for Contractor's applications for payment. Payment will not be released until a Schedule of Values is accepted.
- B. Schedule of Values shall appear similar to the following list and generally following the Table of Contents of this Project Manual as the format for listing component items. It shall be detailed at least as shown and portions shall not be more largely grouped so as to reduce its length unless appropriate to the scope of the Work. Mobilization/Start-up is limited to 2 percent on contracts greater than \$1,000,000 and 4 percent on contracts less than \$1,000,000. Contract closeout to be a minimum of 2 percent.
  - 1. Mobilization/Start-up.
  - 2. Temporary Facilities.
  - 3. Structural Steel/Metals.
  - 4. Lumber.
  - 5. Roofing.
  - 6. Roof Hatches.

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7. Caulking and Sealants.
8. HVAC/Sheet Metal.
9. Electrical – Building.
10. Labor/Supervision.
11. Cleanup.
12. Contract Closeout.

**2.4 SUBMITTAL SCHEDULE**

- A. Contractor shall prepare and submit to Architect a "Submittal Schedule" when required by the General Conditions showing scheduled dates of submittals and date required for return of submittals to Contractor.
- B. Contractor shall provide in Schedule the minimum specified working days for Architect to review and check submittals provided it is not a deferred approval item. Based on the number and complexity of submittals at any one time, Architect's review period may be longer than the days specified.
- C. Dates on "Submittal Schedule" shall be agreed upon by both Architect and Contractor.

**2.5 PROJECT DIRECTORY**

- A. After execution of the Contract but prior to commencement of Work, Contractor shall submit to Architect a Project Directory listing subcontractors and vendors on the Project and giving a brief description of their scope of work, firm name, contact person, address, phone number, e-mail address, and fax number if used.

**2.6 SHOP DRAWINGS**

- A. Submit shop drawings as a copy of the original set maintained by the Contractor. Shop drawings are to include the name of the project, the name of Contractor and are to be numbered consecutively. Provide legible and complete copies in every respect. Provide quantity as described below. Do not reproduce the Contract Drawings in lieu of Contractor or subcontractor produced shop drawings.
- B. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on Drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of the Contract Documents. Unless specific changes have been noted and approved, no deviations from Contract Documents will be accepted.

**2.7 PRODUCT DATA / MATERIAL LISTS**

- A. Manufacturer's Standard Schematic Drawings:
  1. Modify Manufacturer's drawings to delete information which is not applicable to the Project.
  2. Supplement standard information to provide additional information which is applicable to the Project.

- B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
  - 1. Clearly mark each copy to identify pertinent materials, products or models. Mark out or remove extraneous information.
  - 2. Show dimensions and clearances required.
  - 3. Show performance characteristics and capacities.
  - 4. Show wiring diagrams and controls.

## **2.8 SAMPLES**

- A. Samples: Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
  - 1. Include identification on samples including product and material and location of proposed work.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of product or material, with integrally related parts and attachment devices.
  - 2. After review, samples may be used in construction of project.
- C. Field samples and mockups:
  - 1. Erect at project site at location acceptable to Architect.
  - 2. Construct each sample or mockup complete, including work of trades required in finished work.

## **2.9 REQUESTS FOR INFORMATION (RFI)**

- A. Requests for additional information (RFI's) beyond that set-forth in the Contract Documents will be considered when the request is in writing and fully documented. Requests shall state the source and reason for the request; identify specific references within the Contract Documents pertinent to the request; and supply supporting information to assist the Architect in his/her response. Verbal responses to such requests are to be considered informational; official response will only be given in writing.
  - 1. Submit RFI's on standard form, included with this Section, and numbered consecutively.
  - 2. Allow a minimum of 72-hours for review by Architect. Additional time may be required for more complex issues.
  - 3. Provide suggested solution on standard RFI form where indicated.
  - 4. Provide detailed cost estimate for RFI's that are anticipated to exceed \$500 in extra costs to the Owner.
- B. Because RFI's are used for clarification or Construction Document interpretation purposes, the response will be issued back to the Contractor in the space provided on the standard RFI form. More complex issues requiring Contract Document revisions and/or which may result in a change in cost to the Contract will be handled using a

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Construction Change Document (CCD). RFI's and CCD's will not be used to address simple or minor coordination or construction issues which can normally be addressed quickly and easily by the Contractor or in conjunction with the Contractor and Architect. RFI's deemed unnecessary or frivolous by the Architect will be returned to the Contractor for reconsideration or will be rejected. RFI's so returned shall be removed from the RFI log and noted as unnecessary.

**2.10 CERTIFICATIONS**

- A. Where specifically indicated by pertinent Specification Sections, submit proper certification of recognized producer or association in lieu of or in addition to testing. Certification shall attest to product's compliance with requirements of Contract Documents.
- B. Certifications for this project shall also include:
  - 1. Fire Alarm System Certification:
    - a. As specified in Division 28.
  - 2. Megger Grounding Test Certificate:
    - a. Submit completed Megger Grounding Test Certificate (included with this section) with Testing Agency reports attached, as specified in Division 26.
  - 3. Certificate of Compliance for Building Materials:
    - a. Submit completed Certification of Compliance for Building Materials (included with this section).

**2.11 MAINTENANCE / OPERATION MANUALS**

- A. General: Contractor shall incorporate in Maintenance/Operation Manual(s) brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance. These items include carpets, resilient flooring, architectural finishes, mechanical and electrical equipment and other items as required elsewhere in Contract Documents. Prepare manuals in durable plastic loose leaf binders sized to accommodate 8-1/2 x 11 sheets with following minimum information:
  - 1. Identification on or readable through, front cover stating general nature of manual.
  - 2. Neatly typewritten index of contents.
  - 3. Site plan and building plans indicating location of equipment referenced (reduced scale).
  - 4. Complete instructions regarding operation and maintenance of equipment involved.
  - 5. Complete nomenclature of replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.
  - 6. Copy of warranties issued, in a separate binder as specified in this Section.
  - 7. Copy of approved shop drawings (reduced scale) with data concerning changes made during construction.
- B. Extraneous Data:

1. Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in the Project installation and delete, or otherwise clearly indicate, manufacturer's data with which the Project installation is not concerned.
- C. Materials shall be organized in a logical and consistent manner, by Specification Section number, with separating tabs clearly marked.
- D. When submitting electronic file via Newforma, materials shall be organized in order ascending by Specification Section number and including clear separation within one pdf file, following format prescribed in paragraphs A and B of this Article.

## **2.12 WARRANTIES AND GUARANTEES**

### **A. Contractor Standard Guarantee:**

1. Furnish Owner with its Standard Guarantee for work executed under this Contract, including approved extra work, to be absolutely free of defects of workmanship and materials for a period of two (2) years from the date of filing of the Notice of Completion.
2. Under the terms of its warranty, Contractor shall guarantee to repair and make good defects and repair damage to other work caused thereby which may occur during the Warranty period at no cost to the Owner.
3. Guarantees and warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect the Guarantee and Warranty between Contractor and Owner.
4. Contractor's Standard Guarantee shall be submitted on the Guarantee/Warranty form included in Section 01 7836, Warranties.

### **B. Subcontractor Standard Guarantee:**

1. Contractor shall countersign and furnish Owner with a Subcontractor Standard Guarantee from each Subcontractor for their work executed under this Contract, and approved extra work, to be free of defects of workmanship and materials for a period equal to the Contractor Standard Guarantee.
2. Under the terms of its warranty, Subcontractor shall guarantee to repair and make good defects and repair damage to other work caused thereby which may occur during the Warranty period at no cost to the Owner.
3. Subcontractors individual Standard Guarantee shall be submitted on Guarantee/Warranty form included in Section 01 7836, Warranties.

### **C. Special or Extended Guarantee/Warranty:**

1. In addition to the Contractor's and Subcontractor's Standard Guarantees, furnish Owner with special or extended warranties in excess of the Standard Warranty term of the Contract where specified in the respective Sections of the Specifications.
2. Where special or extended guarantees are related to work of a Subcontractor, the written Guarantee/Warranty form prepared by the Contractor shall be co-signed by the respective responsible subcontractor and a separate and addition

## **SUBMITTAL PROCEDURES**

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Guarantee/Warranty form shall be prepared by the Subcontractor and co-signed by the Contractor.

3. Each Special or Extended Guarantee/Warranty shall be submitted on the forms included in Section 01 7836, Warranties.
- D. Provide a binder with the executed Guarantee/Warranty forms placed in the order in which they occur in the Project Manual. Include an Index listing each Specification Section, specific items covered and length of warranty for each item.
- E. When submitting electronic file via Newforma, materials shall be organized in order ascending by Specification Section number and including clear separation within one pdf file.

## **2.13 RECORD DRAWINGS AND SPECIFICATIONS**

- A. The Contractor shall prepare and maintain on a current basis an accurate and complete set of Record Drawings and Annotated Specifications showing clearly the following:
  1. Changes, revisions, and substitutions during construction, including, without limitation, field changes.
  2. Addenda, Construction Change Documents and Clarifications issued by the Architect.
  3. The final location of mechanical equipment, ducts, outlets, structural members, walls, partitions, and other significant features. Note both vertical and horizontal dimensions of concealed installations.
  4. Installed locations of underground work and utilities, including storm drain piping, plumbing, electrical and stubs for future connections. Note both vertical and horizontal locations of underground facilities from permanent monuments such as building corners or other permanent structures, and finish grades.
  5. In the event of a specification that allows Contractor to elect one of several brands, makes, or types of material or equipment, the annotations shall show which of the allowable items the Contractor has furnished.
- B. The Contractor shall update the Record Drawings and Specifications as often as necessary to keep them current but no less often than weekly, and up-dated monthly, prior to and pursuant to approval of the progress payment application.
  1. Record drawings and specifications are to remain on site and available for inspection by the District Representative, Project Inspector and the Architect.
  2. Changes shall be made in an accurate and legible manner by a qualified draftsman acceptable to Architect.
  3. Symbols and designations used in preparing Record Drawings shall match those used in the Contract Drawings.
- C. At project completion, the Record Drawings and Annotated Specifications shall be submitted by the Contractor for Owner's Project Inspector and Architect review and comment.



1. These will be returned to the Contractor for revisions. Once corrections have been completed the Inspector shall sign and date the record set coversheet noting it as acceptance of the completed Record Drawings and Specifications.
2. Prior to Application for Final Payment, the original Record Drawings and Specifications are to be resubmitted to the Architect along with a scanned electronic file set in PDF format with each drawing bookmarked, matching the Drawing titles.
3. When submitting electronic file via Newforma, materials shall be organized in order ascending by Sheet Number as shown on the Drawing Sheet Index within one pdf file.

**D. Conditions of Payments:**

1. At the end of each month the Project Inspector will review the record drawings and specifications. If the records are incomplete, or incorrect, an appropriate amount of dollars, equivalent to the cost of uncovering the work to determine the locations of piping and the like, may be deducted from the next progress payment. The deducted sum will be withheld until the record drawings are updated and/or corrected.
2. Written confirmation from the District Representative that the record drawings and specifications have been properly updated weekly shall be submitted with each pay application request, and the existence of such properly updated records shall be a condition precedent to payment.
3. On completion of the Contractor's portion of the Work and prior to Application for Final Payment, the Contractor shall provide one complete set of approved Record Drawings and Specifications to the Owner, in format as specified, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work. Delays in the submission of complete record documents may subject the Contractor to liquidated damages.

**2.14 EXTRA STOCK**

- A. Provide extra stock and materials, as described in the individual Specification Sections, to the Owner at time of final acceptance.
- B. Materials shall be inventoried in writing, neatly packaged, with labels clearly identifying contents and quantities.
- C. Contractor shall obtain written acceptance of delivery from Owner.

**PART 3 - EXECUTION**

**3.1 GENERAL SUBMISSION REQUIREMENTS**

- A. This project is using Newforma Info Exchange for transmission and processing of project documentation. The Contractor is responsible for making contract submissions through this web accessed system. No supplementary software is required for use. User names and passwords will be granted at the beginning of the project.

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- B. Contractor is responsible for the scheduling of submittals in order to avoid detrimental impact to the construction schedule and to support the timely sequence of the Work.
  - 1. Allow a minimum of 15-working days for submittal review by the Architect. Complex submittals or submittals which are not provided as complete packages may take longer than 15-working days for review.
  - 2. Contractor shall allow time for potential rejection and re-submittal of submittals which are being offered as substitution to the specified products.
- C. Contractor shall review submittals for completeness, coordination and conflicts between subcontractors and other Work in the Contract Documents.
  - 1. Subcontractors shall make submittals to Contractor.
  - 2. Submittals made by subcontractors which are not thoroughly reviewed by the Contractor will be returned. Submittals which vary significantly from the Contract Documents and are not so identified prior to submission, will be returned to the Contractor without review.
- D. Mechanical and electrical submittals, excluding underground work, shall each be packaged together so that products/components for these two major disciplines are transmitted to the Architect as a single submittal package for review.
- E. Submittals shall be accompanied by Submittal Transmittal, included at the end of this Section, addressed to the Architect. Each submittal transmittal shall:
  - 1. Be consecutively numbered.
  - 2. Re-submittals to have same submittal number as the original submittal with an alphanumeric suffix.
  - 3. Indicate Specification Section number. Separate submittals are required for each Specification Section involved.
  - 4. Include proper number of copies, as required in "Number of Copies Required" below.
  - 5. Contain index of items submitted, properly identified with Drawing numbers, etc.
  - 6. Substitutions shall be accompanied by a completed Substitution Request Form (included with the Project Manual).
- F. Electronic Submittals.
  - 1. Product data submitted electronically shall be submitted in .pdf format. Submittals shall be organized in a logical format grouping items and subsections together. The first page of each item or subsection must be bookmarked and properly labeled. If multiple fixtures or products are included in a single submittal, each item and corresponding information shall be separately grouped and bookmarked as noted above. This formatting and bookmarking shall also apply to other data submitted electronically like warranties/guarantees, maintenance & operations manuals and certifications.
  - 2. Shop drawings submitted electronically shall be submitted in .pdf format. Shop drawings shall be organized in a logical format grouping sections together (plans, elevations, details, schedules, etc.). Each sheet of the shop drawings shall be

bookmarked and properly labeled. Plan references and detail callouts shall be hyperlinked to properly jump to the referenced page or detail.

G. Number of Copies Required - Contractor shall submit following number of copies:

1. Subcontractor List: 1-electronic copy in PDF.
2. Progress Schedule: 1-electronic copy in PDF.
3. Schedule of Values: 1-electronic copy in PDF.
4. Shop Drawings: 1-electronic copy in PDF format.
5. Product Data/Material Lists: 1-electronic copy in PDF format.
6. Samples: As specifically indicated in the respective Specification Section or, if not indicated, two more than the Contractor requires to be returned.
7. Samples for Color/Pattern Selection: One set of manufacturer's complete range for initial selection; and 4 samples as requested of selected color/pattern for inclusion in final color boards.
  - a. As color selection is dependent on multiple submittals, it is critical that items requiring color decisions be submitted as early as possible and at the same time.
  - b. Selections will not be finalized until color dependent/selection submittals are received.
8. Substitution Request: 1-electronic copy in PDF.
9. Request for Information: 1-electronic copy in PDF.
10. Electronic Transfer: 1-electronic copy in PDF.
11. Certifications: 1-electronic copy in PDF.
12. Maintenance/Operations Manuals: After approved via Newforma submittal, 1-hard copy plus 1-electronic copy in format acceptable to the Owner.
13. Guarantees/Warranties: After approved via Newforma submittal, 1-hard copy, plus 1-electronic copy in format acceptable to the Owner. Refer to Section 01 7836, Warranties, for forms and additional requirements for assembly of guarantees/warranties.
14. Record Drawings: After approved via Newforma submittal, 1-hard copy plus 1-electronic copy in format acceptable to the Owner.

H. Submittals shall include the following, as applicable:

1. Date and revision dates.
2. Project title and number.
3. The names of Architect, Contractor, Subcontractor and supplier or manufacturer.
4. Identification of product or material.
5. Relation to adjacent structure or material.
6. Field dimensions, clearly identified as such.
7. Specification section number.
8. A blank space for Architect's stamp.

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9. Contractor's stamp on each, initialed or signed, certifying that submittal was reviewed, field measurements have been verified and submittal is in compliance with the applicable Specification Section and the overall Contract Documents.

- I. Incomplete, inaccurate or non-complying submittals requiring revisions, re-submittal and additional review time, shall not be considered as a basis for Contract time extension.

### **3.2 PROCEDURES FOR ACTION SUBMITTALS**

- A. Action Submittals are identified in the respective Specification Section and shall be submitted in accordance with the specified web based access system.

- B. Number of Copies: As specified under Article "General Submission Requirements."

- C. Architect's Review:

1. General:

- a. Except for finish, color, and other aesthetic matters left to Architect's decision by Contract Documents, Architect's review is only for Contractor's convenience in following work and does not relieve Contractor from responsibility for deviations from requirements of Contract Documents.
- b. Do not construe Architect's review as a complete check or relief from responsibility for errors or omissions of any sort in shop drawings or schedules or from necessity of furnishing work required by Contract Documents that may not have been shown on shop drawings.
- c. Architect's review of a separate item does not indicate review of complete assembly in which it functions.
- d. Review comments of the Architect (or its consultants) will be shown when it is returned to the Contractor. The Contractor shall make and distribute such copies as are required for its purposes.

- D. Processing:

1. Architect will review Action Submittals in accordance with agreed upon "Submittal Schedule" and will return them to Contractor with Architect's stamp.
2. Notations by Architect which increase Contract cost or time of completion shall be brought to Architect's attention before proceeding with work. Failure to do so will result in the increased costs being borne by the Contractor.
3. Each submittal will be stamped indicating appropriate action to be taken by the Contractor.
4. If for any reason the Contractor cannot comply with the notations, Contractor shall re-submit submittal. In the transmittal letter accompanying the re-submittal, clearly describe the reason(s) for not being able to comply with the notations.

- E. Action and Distribution:

1. Architect will stamp submittals and Contractor shall comply with action noted on the Architect's "Submittal Review" stamp.

2. Unless otherwise directed for mutually agreed or required by the Architect's stamp, Architect will return submittals to the Contractor via the specified web access system.
  3. If corrections are required, the Contractor is responsible for making the necessary corrections and re-submitting the shop drawings in a timely fashion as to not affect the project schedule.
  4. The Contractor shall secure final acceptance prior to commencing work involved.
- F. Consultants' Review:
1. Submittals requiring review by Architect's or Owner's consultants shall be uploaded to the specified web access system for distribution by the Architect.
  2. Processing shall be in accordance with consultants stamp.
    - a. If action required by consultants stamp is not clear, Contractor shall immediately notify the Architect for a clarification.
    - b. If returned submittal also includes the Architect's stamp, processing shall be in accordance with the Architect's stamp.
- G. Revisions:
1. If revisions are required, the Contractor is responsible for making the necessary changes pertinent to by comments noted on the submittal and re-submitting the shop drawings in a timely fashion as to not affect the project schedule.
  2. If the Contractor considers any required revision to be a change, they shall so notify the Architect.
  3. Show each revision by number, date, and subject in a revision block on the submittal.
  4. If for any reason Contractor cannot comply with the notations, Contractor shall resubmit submittal.
- H. Revisions after Review: When a submittal has been reviewed by the Architect, resubmittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary.

### **3.3 PROCEDURES FOR INFORMATIONAL SUBMITTALS**

- A. Informational Submittals are identified in the respective Specification Section and shall be submitted in accordance with the specified web based access system.
- B. Number of Copies: As specified under Article "General Submission Requirements."
- C. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- D. Test and Inspection Reports: Comply with requirements specified in Section 01 4523, Testing and Inspection Services.

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**3.4 PROCEDURES FOR CLOSEOUT AND MAINTENANCE MATERIAL SUBMITTALS**

- A. Closeout and maintenance material submittals are identified in the respective Specification Section and shall be submitted as specified or, if not specified, in accordance instructions provided by the Architect.
- B. Comply with the additional requirements specified in Section 01 7700, Closeout Procedures.

**3.5 FORMS**

- A. The following submittal forms are included as part of this Section.
  - 1. Submittal Transmittal.
  - 2. Substitution Request.
  - 3. Request for Information.
  - 4. Electronic Data Request.
  - 5. Megger Grounding Test Certificate.
  - 6. Certification of Compliance for Building Materials.

**END OF SECTION**

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Last Updated: June 17, 2020*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Alteration requirements for modernizations, remodels, and additions.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 1100, Summary of Work.
- B. Section 01 7329, Cutting and Patching.

### **1.3 REFERENCES AND STANDARDS**

- A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Contractor to coordinate and conduct a meeting with the demolition contractor to verify which systems, if any, are to be protected and maintained. Such systems shall be clearly identified and marked to avoid unnecessary damage or removal.
  - 2. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate Owner occupancy.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer and Installer Qualifications: As specified in the product specifications.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. Single Source Responsibility: Use materials and products of one manufacturer whenever possible.
- D. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

### **1.6 FIELD CONDITIONS**

- A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

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**PART 2 - PRODUCTS**

**2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK**

- A. New Materials: As specified in product Sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspection and testing products where necessary, referring to existing work as a standard.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that demolition is complete and areas are ready for installation of new work.
- B. Inspect conditions of uncovered work affecting installation of products or performance work.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. Beginning of restoration work means acceptance of existing conditions.
- E. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

**3.2 PREPARATION**

- A. Close openings in exterior surfaces to protect existing work and salvage items for weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.
- B. Cut, move or remove items as necessary for access to alterations and renovation work.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete.
- E. Prepare surface, and remove surface finishes to provide for proper installation of new work and finishes including blocking, framing, insulation, etc.
- F. Replace materials as specified for finished work.

**3.3 INSTALLATION**

- A. Complete Project in all respects including operational mechanical and electrical work.
- B. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition, and installation of concealed work, as specified in Section 01 7329, Cutting and Patching,



- C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- D. Install products as specified in individual specifications Sections.
- E. Where materials or equipment are removed, but no new finish is scheduled, patch and repair any damage to match existing wall surface.

### **3.4 TRANSITIONS**

- A. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work is to match existing adjacent work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural point of division and make recommendation to Architect.

### **3.5 ADJUSTMENTS**

- A. Where a change of plane of 1/8" or more occurs, submit recommendation for providing a smooth transition for Architect review.
- B. Fit work at penetrations of surfaces as specified in Section 01 7329.

### **3.6 FINISHES**

- A. Finish surfaces as specified in individual Product Sections.
- B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

### **3.7 REPAIR OF DAMAGED SURFACES**

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.
- C. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

### **3.8 CLEANING**

- A. Upon completion of installation, remove manufacturer's temporary labels and marks of identification. Thoroughly clean surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition.

### **3.9 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

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- B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

**END OF SECTION**

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Last Updated: December 16, 2021*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Special environmental, sustainable, and “green” building practices related to indoor air quality, resource efficiency supplementing the Pollutant Control requirements specified under Section 01 8113.10, Sustainable Design Requirements, and to ensure healthy indoor air quality in final Project.
- B. Contractor is required to comply with sustainable building practices during construction and when considering materials for substitutions. Refer to Article “Design Requirements.”

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions.
- B. Section 01 7419, Construction Waste Management and Disposal.
- C. Section 01 8113, Sustainable Design Requirements.
- D. Division 23, Mechanical General Conditions.
- E. Division 23, Packaged Air Conditioning Units.

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Sustainable Design Submittals shall comply with the additional requirement of Section 01 8113, Sustainable Design Requirements.
  - 3. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

### **1.4 DESIGN REQUIREMENTS**

- A. Owner has established general environmental goals for design and for construction of the Project.
  - 1. In addition to the Contractor, the Contractor’s construction team, including subcontractors, suppliers, and manufacturers, are encouraged to participate where possible to realize the Owner’s environmental goals.
  - 2. Intent is for environmental goals to be achieved in a manner which ultimately provides a safe and healthy environment for building occupants with minimal impact on the local, regional and global environment.
- B. Environmental Goals:

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1. Refer to specific Specifications Sections for more detailed construction requirements related to specific materials and systems.

#### **1.5 INFORMATIONAL SUBMITTALS**

##### **A. Indoor Air Quality (IAQ) Data:**

1. Environmental Issues: Submit emission test data produced by acceptable testing laboratory, listed in this Specification Article "Quality Assurance," for materials as required in each specific Specification Section.
  - a. Laboratory reports shall contain emissions test data on Volatile Organic Compounds (VOCs) including Total Volatile Organic Compounds (TVOC), specific individual VOCs, formaldehyde and other aldehydes as described in this Section.
  - b. Identify VOCs emitted by each material as required in these Specifications, and demonstrate compliance with the California Green Building Standards Code, edition current as of the date of this Contract.
  - c. Specific test conditions and requirements are set forth in the Specifications. For required tests, submit documentation of sample acquisition, handling, and test specimen preparation, as well as test conditions, methods, and procedures. The tests consist of a 10-day conditioning period followed by a 96-hour test period.
    - 1) Samples collected during the test period at 24, 48, and 96-hours shall be analyzed for TVOC and formaldehyde.
    - 2) VOC samples collected at 96 hours shall be identified and quantified for compounds that are found on the list of Chemicals of Concern. The Chemicals of Concern list is based on the California OEHHA list as of September 2002 (The most recent list shall be used for this Specification as published at:
      - a) [http://www.oehha.org/air/chronic\\_rels/allChrels.html](http://www.oehha.org/air/chronic_rels/allChrels.html).
2. Cleaning and Maintenance Products: Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products. These procedures are for final Contractor cleaning of the project prior to Substantial Completion and for provided materials and products as required by the specific Specification Sections.
  - a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1 percent of the total mass of the cleaning product is a carcinogen or reproductive toxicant as identified in the Chemicals of Concern list referenced above.
  - b. Avoid cleaning products containing alpha-pinene, d-limonene or other unsaturated carbon double bond alkenes due to chemical reactions with ozone to form aldehydes, acidic aerosols, and ultra-fine particulate matter in indoor air.

##### **B. Certificates:**

1. Prior to Final Completion, submit a certificate signed by corporate office holder of Contractor, subcontractor, supplier, vendor, installer or manufacturer primarily responsible for the manufacturing of the product, indicating materials provided are essentially the same, and contain essentially the same components as products and materials tested.
2. Comply with requirements specified in Specification Section 01 7700, Closeout Procedures.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Submit data relating to Environmental Issues.
  1. Submit environmental product certifications, in two forms:
    - a. Two CD-ROMs organized by CSI Division Format.
    - b. Three three-ring binders organized by CSI Division Format with Table of Contents and with dividers for each Division.

## **1.7 QUALITY ASSURANCE**

- A. Environmental Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for environmental issues compliance and coordination.
  1. Experience: Environmental project manager shall have experience relating to sustainable building construction.
  2. Responsibilities: Carefully review the Contract Documents for environmental issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
  3. Meetings: Discuss Environmental Goals at following meetings.
    - a. Pre-construction meeting.
    - b. Pre-installation meetings.
    - c. Regularly scheduled job-site meetings.
    - d. Special sustainability issues meetings.
- B. Environmental Issues Criteria: Comply with requirements listed in the Specification Sections.
- C. Acceptable Indoor Air Emissions Testing Laboratories:
  1. Selection of testing laboratories shall include assessment of prior experience in conducting indoor source emissions tests.
  2. The proposed laboratory shall be an independent company or organization not related to the manufacturer of the products to be tested.
  3. Submit documentation on proposed laboratory for review and approval by Owner.

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#### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.
  - 1. Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.
  - 2. Unacceptable Packaging Materials: Polyurethane, polyisocyanate, polystyrene, polyethylene, and similar plastic materials such as “foam” plastics and “shrink-fit” plastics.
  - 3. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by the manufacturers or suppliers for reuse where the reclamation program exists or where a program can be developed for such reuse.
  - 4. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling.
  - 5. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of the construction waste management recycling program, or return to the material’s manufacturer for use by the manufacturer or supplier.
  - 6. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to the supplier or manufacturer for reuse where such program is available.
- B. Comply with the additional requirements specified in Section 01 7419, Construction Waste Management and Disposal.

#### **1.9 FIELD CONDITIONS**

- A. No smoking will be permitted in indoor Project site locations, in accordance with California Labor Code (Section 400-6413.5).
- B. Environmental Product Certification:
  - 1. Include certification that indicates cleaning materials comply with requirements of these Specifications.
- C. Construction Ventilation and Preconditioning:
  - 1. Temporary Construction Ventilation: Maintain sufficient temporary ventilation of areas where materials are being used that emit VOCs. Maintain ventilation continuously during installation, and until emissions dissipate following installation. If continuous ventilation is not possible utilizing the building’s HVAC system(s) then ventilation shall be supplied using open windows and temporary fans, sufficient to provide no less than three air changes per hour.
    - a. Period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in these Specifications, a time period of 72 hours shall be used.
    - b. Ventilate areas directly to outside; ventilation to other enclosed areas is not acceptable.

2. During dust producing activities, including drywall installation and finishing, turn ventilation system off, and openings in supply and return HVAC system shall be protected from dust infiltration. Provide temporary ventilation as required.
3. Preconditioning: Prior to installation, allow products which have odors and significant VOC emissions to off-gas in dry, well-ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions prior to delivery to Project site and installation.
  - a. Condition products without containers and packaging to maximize off-gassing of VOCs
  - b. Condition products in ventilated warehouse or other building. Comply with substitution requirements for consideration of other locations.

**D. Protection:**

1. Moisture Stains: Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediately remove from site and properly dispose.
  - a. Take special care to prevent an accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products
  - b. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
  - c. Replace moldy materials with new, undamaged materials.
2. Ducts: Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside of ducts.

**PART 2 - PRODUCTS**

**2.1 SUBSTITUTIONS**

- A. Requests for substitutions shall comply with requirements specified in Specification Section 01 3300, Submittals, and with the following additional information required where environmental issues are specified:
  1. Indicate how each proposed substitution complies with requirements for VOCs.
  2. Owner, in consultation with Architect reserve the right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for the specified materials.
  3. Comply with the specified recycled content and other environmental requirements.

**PART 3 - EXECUTION**

**3.1 FIELD QUALITY CONTROL**

- A. Sequencing:

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1. On-Site Application: Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
  2. Complete interior finish material installation no less than 14 days prior to Substantial Completion to allow for Building Flush Out as described in Paragraph 3.1B.
- B. Building Flush Out: Just prior to Substantial Completion, flush out building air continuously using maximum tempered outside air, or maximum amount of outside air while achieving reasonable indoor temperature, for at least 14 calendar days. Continuously is defined as 24 hours per day, 7 days a week. If interruptions of more than a few hours are required for testing and balancing purposes, extend flush out period accordingly in order to achieve the minimum 14 calendar day building flush out period.
1. When Contractor is required to perform touch-up work, provide temporary construction ventilation during installation and extend building flush-out by a minimum of 4 calendar days after touch-up installation is complete with maximum tempered outside air for 24 hours per day.
  2. If construction schedule permits, extend flush-out period beyond minimum building flush out period for an additional 15 days.
  3. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

### **3.2 CLEANING**

- A. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces using cleaning and maintenance products that conform to standards as described in Part 1 of this Section.
- B. Clean equipment and fixtures to sanitary condition using cleaning and maintenance products that conform to standards as described in Part 1 of this Section.
- C. Products used for cleaning shall comply with Proposition 65 and the additional restrictions for volatile organic compounds specified in Section 01 6116.
- D. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.
- E. If ducts were not sealed during construction, and contain dust or dirt, clean ducts using HEPA vacuum immediately prior to Substantial Completion and prior to using ducts to circulate air. Oil film on sheet metal shall be removed before shipment to site. Ducts shall be inspected to confirm that no oil film is present. Remove oil film.
- F. Replace air filters, both pre and final filters, just prior to Substantial Completion.
- G. Remove and properly dispose of recyclable materials using construction waste management program described in Section 01 7419, Construction Waste Management and Disposal.



**3.3 PROTECTION**

- A. Protect interior materials from water intrusion or penetration where interior products are not intended for wet applications and are exposed to moisture.
- B. Protect installed products using methods that do not support growth of mold and mildew.
  - 1. Immediately remove from site materials with mold or mildew.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Standard reference abbreviations use in the Project Manual.
  - 2. Requirements for standard references use in the various Specification Sections.

### **1.2 STANDARD SPECIFICATIONS**

- A. The contract Documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections and tests published and issued by the organizations, societies, and associations. Such references are hereby made part of the Contract Documents to the extent required.
- B. When standard specifications are included by abbreviation and number only, it is assumed that the Contractor is familiar with and has ready access to the specified standards.
- C. When the effective date of a reference standard is not given, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of original issue of these Contract Documents, as indicated on the cover, shall govern the Work.
- D. Reference standards are not furnished with the contract Documents, because the Contractor, subcontractors, manufacturers, suppliers, and the trades involved are assumed to be familiar with their requirements
- E. Contractor shall obtain its own copies of required specified referenced publications.
- F. The specification or standard referred to shall have full force and effect as though printed in these specifications.
- G. In addition to those standards specifically referenced in the Specifications, comply with the accepted industry standards and trade association recommendations for the respective portions of Work.
- H. In the case of difference between referenced standards and the Contract Documents, the most stringent requirements prevail.

### **1.3 STANDARD SPECIFICATION ABBREVIATIONS**

- A. In addition to abbreviations indicated on the Drawings, references in the Project Manual to trade associations, technical societies, recognized authorities, and other institutions may include the following organizations, which are sometimes referred to by only the corresponding abbreviations. Not all abbreviations are listed, and not all listed abbreviations are used.
- B. Initialisms and Acronyms:

## **ABBREVIATIONS AND ACRONYMS**

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- |     |          |   |
|-----|----------|---|
| 1.  | AA       | Aluminum Association  |
| 2.  | AAMA     | American Architectural Manufacturers Association                          |
| 3.  | AASHTO   | American Association of State Highway and Transportation Officials        |
| 4.  | AATCC    | American Association of Textile Chemists and Colorists                    |
| 5.  | ABAA     | Air Barrier Association of America  |
| 6.  | ACI      | American Concrete Institute   |
| 7.  | ACS      | Access Compliance Section (DSA)   |
| 8.  | ACSE     | American Society of Civil Engineers                                       |
| 9.  | ADA      | American with Disabilities Act  |
| 10. | AGA      | American Galvanizers Association  |
| 11. | AIA      | American Insurance Association (successor to NBFU)                        |
| 12. | AISC     | American Institute of Steel Construction                                  |
| 13. | AISI     | American Iron and Steel Institute   |
| 14. | AITC     | American Institute of Timber Construction                                 |
| 15. | ALSC     | American Lumber Standards Committee                                       |
| 16. | ANSI     | American National Standards Institute                                     |
| 17. | APA      | The Engineered Wood Association   |
| 18. | ASHRAE   | American Society of Heating, Refrigerating, and Air Conditioning          |
| 19. | ASTM     | ASTM International  |
| 20. | AWI      | Architectural Woodwork Institute  |
| 21. | AWPA     | American Wood Protection Association                                      |
| 22. | AWS      | American Welding Society  |
| 23. | BHMA     | Builders Hardware Manufacturers Association                               |
| 24. | CALGreen | California Green Building Standards Code                                  |
| 25. | CBC      | California Building Code  |
| 26. | CEC      | California Electrical Code  |
| 27. | CFC      | California Fire Code  |
| 28. | CLFMI    | Chain Link Fence Manufacturing Institute                                  |
| 29. | CMC      | California Mechanical Code  |
| 30. | CPC      | California Plumbing Code  |
| 31. | CRA      | California Redwood Association  |
| 32. | CRI      | Carpet and Rug Institute  |
| 33. | CRSI     | Concrete Reinforcing Steel Institute                                      |
| 34. | CS       | Commercial Standard of National Bureau of Standards (US Dept of Commerce) |
| 35. | DHI      | Door and Hardware Institute   |
| 36. | DSA      | Division of the State Architect   |
| 37. | DTSC     | Department of Toxic Substances Control                                    |
| 38. | EPA      | Environmental Protection Agency   |
| 39. | FDA      | U.S. Food and Drug Administration   |

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40.	FLS	Fire & Life Safety (DSA)
41.	FM	Factory Mutual
42.	FS	Federal Specification of General Services Administration
43.	FSC	Forest Stewardship Council
44.	GA	Gypsum Association
45.	HMMA	Hollow Metal Manufacturers Association
46.	ICC-ES	International Code Council Evaluation Service
47.	ISO	International Organization for Standards
48.	MIA	Masonry Institute of America
49.	MMPA	Moulding and Millwork Producers Association
50.	MPI	Master Painters Institute
51.	NAAMM	National Association of Architectural Metal Manufactures
52.	NAAWS	North American Architectural Woodwork Standards
53.	NBFU	National Board of Fire Underwriters (See AIA)
54.	NBHA	National Builders Hardware Association
55.	NEC	National Electric Code of NFPA
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association
58.	NFSHSA	National Federation of State High School Associations
59.	NRCA	National Roofing Contractors Association
60.	OSHA	Occupational Safety and Health Administration
61.	PCA	Portland Cement Association
62.	PCI	Precast Concrete Institute
63.	PI	Project Inspector
64.	PLIB	Pacific Lumber Inspection Bureau
65.	RIS	Redwood Inspection Service (Grading Rules)
66.	SCAQMD	South Coast Air Quality Management District
67.	SEI	Structural Engineering Institute
68.	SDI	Steel Door Institute
69.	SJI	Steel Joist Institute
70.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
71.	SMF	Office of the State Fire Marshal
72.	SPR	Simplified Practice Recommendation (US Dept. of Commerce)
73.	SSMA	Steel Stud Manufacturers Association
74.	SSPC	The society for Protective Coatings
75.	SWPPP	Storm Water Pollution Prevention Plan
76.	TCNA	Tile Council of North America
77.	Title 19	California Code of Regulations - Public Safety
78.	Title 24	California Code of Regulations - Building Codes
79.	TMS	The Masonry Institute

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80.	UL	Underwriter's Laboratories, Inc.
81.	WCLIB	West Coast Lumber Inspection Bureau (successor to WCLA)
82.	WDMA	Window and Door Manufacturers Association
83.	WI	Woodwork Institute
84.	WRCLA	Western Red Cedar Lumber Association
85.	WWPA	Western Wood Products Association

### **END OF SECTION**

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acronyms.docx*

*Last Updated: December 16, 2021*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

A. Section Includes:

1. Definitions of terms and requirements pertaining to the contract documents,

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and other Division 1 Specification Sections, apply to work of this section.

### **1.3 DESCRIPTION OF REQUIREMENTS**

- A. General Explanation: A substantial amount of specification language consists of definitions for terms found in other contract documents, including the drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.) Certain terms used in contract documents are defined in this Section. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the Contract Documents.
- B. General Requirements: The provisions or requirements of Division 1 sections apply to entire work of Contract and, where so indicated, to other elements which are included in project.
- C. Governing Regulations: Refer to General for requirements related to compliance with governing regulations.
- D. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in sections at first instance of use. Trade association names and titles of general standards are frequently abbreviated.

### **1.4 DEFINITIONS**

- A. Approve: Where used in conjunction with Architect's/ Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.
- B. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and

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"permitted" mean "directed by Architect", "requested by Architect", and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

- C. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, unloaded, ready for assembly, installation, etc., as applicable in each instance. See Also "Provide".
- D. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specification, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- E. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance. See also "Provide".
- F. Installer: The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in the operations they are engaged to perform.
- G. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to Architect for decision before proceeding.
- H. Project Site: The term "project site" is defined as the space available to the Contractor for performance of the work, either exclusively of or in conjunction with others performing other work as part of the project. The extent of the project site is shown on the drawings, and may or may not be identical with the description of the land upon which the project is to be built.
- I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
- J. Specialists, Assignments: In certain instances, specification test requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; they are also not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended

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to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

- K. Testing Laboratory: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.
- L. Trades: Except as otherwise indicated, the use of titles, such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

**1.5 DRAWING SYMBOLS:**

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

**1.6 INDUSTRY STANDARDS:**

- A. General Applicability of Standards: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, applicable standards of the construction industry have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herewith. Refer to other contract documents for resolution of overlapping and conflicting requirements which result from the application of several different industry standards to the same unit of work. Refer to individual unit of work sections for indications of which specialized codes and standards the Contractor must keep at the project site, available for reference.
- B. Referenced Standards (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.
- C. Non-referenced Standards are hereby defined as having no particular applicability to the work, except as a general requirement of whether the work complies with standards recognized in the construction industry.
- D. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.



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- E. Copies of Standards: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.
1. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
  2. Although a certain number of copies of these standards may be required as a part of the submittal, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.
- F. Acronyms: Where acronyms are used in the specifications or other contract documents they are defined to mean the industry recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the test provision.

**1.7 GOVERNING REGULATIONS/AUTHORITIES**

- A. General: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the work.
- B. "Regulations" is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

**1.8 SUBMITTALS**

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipt for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Administrative and procedural requirements related to inspections, tests, and related quality control procedures required to be performed by the Contractor and that facilitate the Contractor's compliance with the Contract Documents.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3300, Submittal Procedures; submission of manufacturers' instructions and certificates.
- B. Section 01 4523, Testing and Inspecting Services, and DSA 103; Special Tests and Inspections required by authorities having jurisdiction and are the responsibility of Owner.
- C. Section 01 7700, Closeout Procedures.
- D. Specific requirements for testing, inspections, mockups, and other quality control requirements as described in the various Sections of the Specifications.

### **1.3 DEFINITIONS**

- A. Experienced: When used with an entity or individual, and unless otherwise specified, means having successfully completed a minimum of three previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
- D. Tests: Procedures intended to establish the quality, performance, or reliability of a product or system conducted by a qualified Testing Agency.
- E. Source Quality-Control Tests: Tests and inspections related to materials manufactured or fabricated away from the jobsite that will be incorporated into the work.
- F. Testing Agency: An independent entity engaged to perform specific tests, inspections, or both, is qualified to operate in California, and meets the additional requirements specified.
  - 1. Testing laboratory shall mean the same as Testing Agency.

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- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include Contract administration activities performed by Architect.

**1.4 REFERENCES AND STANDARD SPECIFICATIONS**

- A. General:
  - 1. The Contract Documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections, and tests published and issued by the organizations, societies, and associations.
  - 2. Contractor shall obtain its own copies of required specified referenced publications.
  - 3. The specification or standard referred to shall have full force and effect as though printed in these Specifications.
  - 4. When the effective date of a reference standard is not specified, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of the DSA approval, shall govern the Work.
  - 5. The contractual relationships, duties, and responsibilities of the parties in Contract or those of the Architect shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- B. Products or workmanship specified by association, trade, or other consensus standards shall comply with requirements of the referenced standard or specification except when more rigid requirements are specified or are required by applicable codes.
- C. Conflicting Requirements:
  - 1. If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement.
  - 2. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

**1.5 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Schedule of Tests and Inspections.
- B. Field Superintendent's Quality Control Responsibilities
- C. Procedures for inspection prior to subsequent Work or cover up.
- D. Qualifications of Contractor's Testing Agencies.
- E. Certified copies of Reports and Documents.

**1.7 CLOSEOUT SUBMITTALS**

- A. Permits, Licenses, and Certificates: Copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.
- B. Test and Inspection Log including final record for each test and inspection as specified in Part 3 and in accordance with Section 01 7839, Project Record Documents.

**1.8 REPORTS AND DOCUMENTS**

- A. Test and Inspection Reports: Prepare and submit certified written reports where specified in the Specification Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and re-inspecting.

**1.9 QUALITY ASSURANCE**

- A. Minimum Quantity or Quality Levels:

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1. The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.
  2. Refer uncertainties to Architect for a decision before proceeding.
- B. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- C. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- D. Correct conditions or workmanship not in conformance with specified standards or quality. Do so immediately after non-conformance item is discovered or within a reasonable time frame agreed upon with Construction Manager.
- E. Comply with manufacturers' instructions, including each step in sequence. Should manufacturers' instructions conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. Comply with specified standards as minimum quality for the Work, except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- G. Perform Work by persons qualified to produce required and specified quality.
- H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- I. Upon delivery to the jobsite, materials and products shall be inspected for compliance with the Project Specifications.
1. Nonconforming materials, products, equipment, hardware, tools and/or safety devices shall be removed immediately from the general work area and stored within a secured area approved by the Owner as "NON CONFORMING MATERIALS AREA" to ensure that defective or nonconforming materials are not incorporated into or used on the project
  2. Materials or products shall not be removed from the designated area until they are deemed by the Architect to be in compliance, or until they are modified or fixed to meet the project specifications, or until they are removed from the jobsite for the purposes of disposal or shipment back to the manufacturer.

**1.10 CONTRACTORS TESTING AGENCY**

- A. Qualifications: At Contractor's expense, provide an independent testing laboratory nationally recognized according to 29 CFR 1910.7 and accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP,) or other independent agency with the experience and capability to conduct testing and inspecting indicated,

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documented according to ASTM E329; with additional qualifications specified in individual Sections; and, where required, that is acceptable to authorities having jurisdiction.

- B. Testing Agency shall cooperate with Architect, Owner's Project Inspector, and Contractor in performance of duties.
- C. Testing Agency shall provide qualified personnel to perform required tests and inspections.
- D. Testing Agency shall not be authorized to release, revoke, alter, or increase the Contract Document requirements, approve or accept any portion of the Work, or perform any duties of Contractor.

**1.11 TESTS AND INSPECTIONS**

- A. Preconstruction Testing: Where preconstruction testing is specified to verify performance requirements, comply with the following as applicable:
  - 1. Contractor Responsibilities:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project unless approved by Architect in writing.
- B. Tests and Inspections indicated in individual Specification Sections shall be conducted by a qualified Testing Agency. The responsibilities of the Testing Agency shall be as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect, Owner's Project Inspector, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submit a certified written report of each test, inspection, and similar quality-control service to Architect and Owner's Project Inspector with copy to Contractor and to DSA.

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4. Submit a final report of tests and inspections at Substantial Completion which includes a list of unresolved deficiencies.
  5. Interpret tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retest and reinspect corrected work.
- C. Monitoring and Documentation: Contractor shall maintain testing and inspection reports including log of approved and rejected results as specified in Part 3.
1. Include work Architect has indicated as nonconforming or defective.
  2. Indicate corrective actions taken to bring nonconforming work into compliance with requirements.
  3. Comply with requirements of the California Division of the State Architect (DSA).

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 NOTIFICATIONS**

- A. Contractor shall provide the following notifications;
1. Owner's Project Inspector writing:
    - a. 24 hours in advance of starting new Work
    - b. 24 hours in advance of each test or inspection
  2. 48 hours' prior notice, minimum, to the Testing Agency for required tests and inspections.

**3.2 TEST AND INSPECTION FIELD BINDER**

- A. Contractor shall maintain in the Field Office a Test and Inspection Field Binder that includes a hard copy of the following documents:
1. Approved Quality Control Plan.
  2. Specification Sections that apply to the respective portions of work.
  3. RFI's, CCD's or other approved document that changes the work.
  4. Manufacturer's Installation Instructions (MII).
  5. Specific details of the Work as requested by the Inspector.
  6. Test and Inspection Log.

**3.3 TEST AND INSPECTION LOG**

- A. Prepare and maintain a record of tests and inspections using an electronic spreadsheet.
- B. Include the following information:

1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. List pertinent detail/sheet number.
  4. List pertinent Specification Section.
  5. Attach manufacturer's installation inspections if applicable.
  6. List and attach RFI's, ASI's or CCD's affecting the Work.
  7. Date Inspector verified work is acceptable.
- C. Final record for each test and inspection shall be submitted on Contractors letterhead and include the name of the responsible person to verify Work was in accordance with the approved Contract Documents.

#### **3.4 MANUFACTURERS' FIELD SERVICES**

- A. When specified in respective Specification Sections, Contractor shall require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting and balancing of equipment as applicable, and to make appropriate recommendations. Contractor is responsible for proper notification of manufacturer's representative before installation of applicable work and for obtaining necessary inspection certificate stating that installation was observed and approved.
- B. Product Performance Verification: The supplier of products specified based on performance criteria shall, at the request of the Agency, inspect the installed product and certify conformance of the product to specified criteria under the installed conditions.
- C. Manufacturer's representative shall submit written report to the Architect listing observations and recommendations.

#### **3.5 TOLERANCES - GENERAL**

- A. Monitor tolerance control of installed products or portions to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### **3.6 DIMENSIONING AND TOLERANCES FOR ACCESSIBILITY**

- A. While it is recognized that construction practices generally permit a level of reasonable dimensional tolerance, the installation of items subject to compliance with the Americans with Disabilities Act Accessibility Guidelines and Chapter 11B of the California Building Code, typically does not allow such tolerances. Therefore, these dimensions are to be considered absolute and will be strictly enforced. Items found to be out of tolerance may require modification and/or replacement at Contractor's expense.



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**3.7 REPAIR AND PROTECTION**

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes.
  - 2. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7329, Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**

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*Last Updated: August 28, 2020*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for Testing Laboratory.
  - 2. Contractor's responsibilities for facilitation of Testing and Inspections.

### **1.2 RELATED SECTIONS AND DOCUMENTS**

- A. DSA 103 - Structural Test & Inspections List.
- B. Division 23, Mechanical Work - Testing, adjusting, and balancing of systems.
- C. Individual Specification Sections: Inspections and tests required, and standards for testing.

### **1.3 REFERENCES**

- A. California Administrative Code (CAC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 SELECTION AND PAYMENT**

- A. Testing laboratory shall be approved by both the Architect and the Division of the State Architect.
- B. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing. Retesting costs for failed tests will be the Contractors responsibility and will be back-charged against the contract.
- C. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

### **1.5 LABORATORY REPORTS**

- A. After each inspection and test, promptly submit two copies of laboratory report to Owner, Architect, Contractor and DSA.
- B. Include:
  - 1. Date of issue,
  - 2. DSA Application and File numbers,
  - 3. Project title and number,
  - 4. Name of inspector,

## **TESTING AND INSPECTION SERVICES**

### **SECTION 01 4523**

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5. Date and time of sampling or inspection,
6. Identification of product and Specification Section,
7. Location in the Project,
8. Type of inspection or test,
9. Date of test,
10. Results of test,
11. Conformance with Contract Documents.

C. When requested by Architect, provide interpretation of test results.

#### **1.6 LIMITS ON TESTING LABORATORY AUTHORITY**

- A. Laboratory may not release, revoke, alter or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop the work.

#### **1.7 CONTRACTOR RESPONSIBILITIES**

- A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs. Allow reasonable time for review and testing.
- B. Arrange for, and coordinate with, laboratory for all required testing and inspection. Provide adequate notice, in advance, for proper scheduling and processing of testing. The Inspector will not be responsible for scheduling or arranging for testing and inspection services.
- C. Cooperate with laboratory personnel, and provide access to the work and to manufacturer's facilities.
- D. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at the source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- E. Notify Architect, Inspector, Structural Engineer (when applicable) and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

**END OF SECTION**

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*Last Updated: December 16, 2021*

**DSA-103**

Issued 9/1/2017

## List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

School Name		District	
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**IMPORTANT:** This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.

**NOTE:** This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

**INSTRUCTIONS:** Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected. **For more information on use of this form, see DSA-103.INSTR.**

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE <sup>1</sup>	PERFORMED BY <sup>2</sup>	CODE REFERENCE AND NOTES
+	SOILS			
+	CONCRETE			Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13
+	MASONRY			TMS 402-13/ACI 530-13/ASCE 5-13 Table 3.1.3 & TMS 602-13/ACI 530.1-13/ASCE 6-13 Table 5
+	STEEL, ALUMINUM			Table 1705A.2.1, AISC 303-10, AISC 360-10, AISC 341-10, AISC 358-10, AISI S100-07/S2-10
+	WOOD			
+	OTHER			

**DSA-103**

Issued 9/1/2017

## List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

### List of required verified report(s):

#### KEY to Columns

1 Type -	2 Performed By -
<b>Continuous</b> – Indicates that a continuous special inspection is required	<b>GE</b> – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
<b>Periodic</b> – Indicates that a periodic special inspection is required	<b>LOR</b> – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
<b>Test</b> – Indicates that a test is required	<b>SI</b> – Indicates that the special inspection is to be performed by a special inspector

\_\_\_\_\_  
Name of Architect or Engineer in general responsible charge

\_\_\_\_\_  
Name of Structural Engineer (When structural design has been delegated)

\_\_\_\_\_  
Signature of Architect or Structural Engineer

\_\_\_\_\_  
date

IDENTIFICATION STAMP  
DIV OF THE STATE ARCHITECT  
APP. #

AC N/A F/LS N/A SS \_\_\_\_\_

DATE \_\_\_\_\_

### Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing

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# **List of Required Structural Tests & Special Inspections - 2016 CBC**

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Revised:

Revised:

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.	
	<b>Soils:</b>
X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
	<b>Concrete/Masonry:</b>
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.
X	4. Epoxy shear dowels in site flatwork.

Exempted by Design Prof.	
	<b>Welding:</b>
X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) <= 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.
(Optional) List details for applicable exempt items:	



**DSA-103**

Issued 9/1/2017

# List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

(Optional) List details for applicable exempt items:

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes general requirements that apply to implementation of the California Energy Code-required acceptance testing without regard to specific systems, assemblies, or components.
- B. Related Sections:
  - 1. Division 01 Section "Facilities Exterior Enclosure Commissioning" for commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.
  - 2. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
  - 3. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
  - 4. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.

### **1.2 ACCEPTANCE TESTING TEAM**

- A. Members Appointed by Contractor: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the acceptance testing process through coordinated action. The acceptance testing team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors.
- B. Members Appointed by Owner:
  - 1. Acceptance Testing Agency: The designated company that plans, schedules, and coordinates the acceptance testing team to implement the acceptance testing process. Owner will engage the acceptance testing agency under a separate contract. All individuals that perform testing from the Acceptance Testing Agency on the project site shall be a certified Acceptance Test Technician (ATT).
    - a. A listing of certified ATT is available at: <https://www.energy.ca.gov/programs-and-topics/ptograms/acceptance-test-technician-certification-provider-program/acceptance> .

### **1.3 CONTRACTOR'S RESPONSIBILITIES**

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform acceptance testing activities including, but not limited to, the following:



## **ENERGY CODE - REQUIRED ACCEPTANCE TESTING**

### **SECTION 01 4533.13**

#### **3431004**

1. Evaluate performance deficiencies identified in acceptance testing reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the acceptance testing agency for resolution of issues.
3. Participate in acceptance testing meetings.
4. Integrate and coordinate acceptance testing process activities with construction schedule.
5. Provide acceptance testing agency with information required to complete checklists.
6. Review and accept checklists provided by the acceptance testing agency.
7. Review and accept test procedures provided by the acceptance testing agency.
8. Complete acceptance testing process test procedures as required by acceptance testing agency.

#### **1.4 ACCEPTANCE TESTING AGENCY RESPONSIBILITIES**

- A. Convene acceptance testing meetings.
- B. Provide Project-specific acceptance testing checklists and procedures.
- C. Prepare and maintain completed checklist log.
- D. Provide Project Inspectors the forms to confirm the required Acceptance Tests have been completed. Final certificate of occupancy cannot be issued until all certificates of acceptance forms are received by the Project Inspector.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

#### **END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: VOC restrictions for product categories listed below under Article "DEFINITIONS" and in compliance with the following.
  - 1. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code.
- B. Products of each category that are installed in the project must comply; applicable laws and ordinances do not allow for partial compliance.
- C. Listing of a product in these Specifications shall not be construed as a solicitation or requirement to use any product or combination of products in violation of the requirements of South Coast Air Quality Management District Rule No.1168, as described in Rule 1168(g).
  - 1. If a listed product does not meet the requirements of this rule, request approval for use of an alternate product by the same or another manufacturer meeting the requirements of this rule.
  - 2. Do not use products which do not meet the requirements of this rule.

### **1.2 RELATED REQUIREMENTS**

- A. Divisions 01 through 33 contain related requirements specific to the work of each of these Sections. Requirements may or may not include reference to this Section.
- B. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.

### **1.3 REFERENCES**

- A. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at [www.chps.net/](http://www.chps.net/).

### **1.4 DEFINITIONS**

- A. VOC-Restricted Products: Products of each of the following categories when installed or applied on-site:
  - 1. Adhesives, sealants, and sealer coatings, regardless of specification Section or Division.
- B. Adhesives: Gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not.

## **VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**

### **SECTION 01 6116.10**

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- C. Sealants: Gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

#### **1.5 SUBMITTAL REQUIREMENTS**

- A. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
- B. Verification of Compliance: Submit for each different product in each applicable category.
  - 1. Identify evidence submittals with the words "CALGreen VOC Compliance Report".
- C. Installer Certifications for Accessory Materials:
  - 1. Require each installer of any type of product, not just the products for which VOC restrictions are specified, to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of their products, or 2) that such products used comply with these requirements.
  - 2. Use the form following at the end of Part 3 in this Section for Installer certifications.

#### **1.6 QUALITY ASSURANCE**

- A. Manufacturer's Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this Section.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General:
  - 1. Provide products conforming to local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application. If specified product exceeds current requirement, provide conforming product at no additional cost.
  - 2. Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168 and less where required by code.
  - 3. Products are specified in multiple Sections throughout these Specifications.
- B. Composite Wood Products: Comply with CALGreen Section 5.504 and Table 5.504.4.5 formaldehyde limits for hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior and exterior of the building.
  - 1. Verification of Compliance: Acceptable types are:
    - a. Certification by manufacturer that product complies with requirements.
    - b. Published product data showing compliance with requirements.

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
**SECTION 01 6116.10**  
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- c. Chain of custody certifications.
- d. Product labeled and invoiced as meeting the Composite Wood Products regulation (CCR, Title 17, Section 93120, et seq.).
- e. Products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269, or European 636 3S standards.
- f. Other method acceptable to enforcing agency.

<b>Table 5.504.4.5 FORMALDEHYDE LIMITS</b>	
<b>Maximum Formaldehyde Emissions in Parts per Million</b>	
<b>Product</b>	<b>Current Limit</b>
Hardwood plywood veneer core	0.05
Hardwood plywood composite core	0.05
Particleboard	0.09
Medium density fiberboard	0.11
Thin medium density fiberboard <sup>1</sup>	0.13
Note 1: Thin medium density fiberboard has a maximum thickness of 5/16 inch (8 mm).	

- C. Insulation: Comply with CALGreen Section 5.504.4.8.2 formaldehyde limits for insulation.
  - 1. Verification of Compliance: Documentation from manufacturer verifying thermal insulation materials meet the pollutant emission limits of one of the following.
    - a. The VOC-emission limits defined in 2014 CACHPS criteria and listed on its High Performance Products Database.
    - b. California Department of Public Health 2010 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010 (also known as Specification 01350.)
- D. Adhesives, Including Carpet and Cushion Adhesives: Comply with CALGreen Section 5.504 and Table 5.504.4.1.
  - 1. Verification of Compliance: Acceptable types are:
    - a. Report of laboratory testing performed in accordance with requirements.
    - b. Published product data showing compliance with requirements.
    - c. Certification by manufacturer that product complies with requirements.
  - 2. Aerosol Adhesives: Comply with Table 5.504.4.1 of CalGreen Section 5.504, and California Code of Regulations Title 17, Section 94507.
    - a. Verification of Compliance: Acceptable types are:
      - 1) Current GreenSeal Certification.
      - 2) Report of laboratory testing performed in accordance with GreenSeal GS-36 requirements.

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
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3) Published product data showing compliance with requirements.

3. Products used shall comply with the following limits.

<b>Table 5.504.4.1 ADHESIVE VOC LIMIT</b>	
<b>Architectural Applications</b>	<b>Current VOC Limit</b>
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Outdoor Carpet Adhesives	150
Wood Flooring Adhesive	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Single Ply Roof Membrane Adhesives	250
Other adhesives not specifically listed	250
<b>VOC Limits and Effective Dates**</b>	
<b>Specialty Applications</b>	<b>Current VOC Limit</b>
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic Cement Welding	250
Adhesive Primer for Plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Top and Trim Adhesive	250
** The specified limits remain in effect unless revised limits are listed in the current governing edition of CalGreen.	
For adhesives, adhesive bonding primers, or any other primer not regulated by the above two Tables and applied to the following substrates, the following limits shall apply:	
<b>Substrate Specific Applications</b>	<b>Current VOC Limit</b>
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass 80	80
Note: If an adhesive is used to bond dissimilar substrates together the adhesive with the highest VOC content shall be allowed.	

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E. Joint Sealants: Comply with CALGreen Section 5.504 and Table 5.504.4.2.

1. Verification of Compliance: Acceptable types are:
  - a. Report of laboratory testing performed in accordance with requirements.
  - b. Published product data showing compliance with requirements.
  - c. Certification by manufacturer that product complies with requirements.
2. Products used shall comply with the following limits.

<b>Table 5.504.4.2 SEALANT VOC LIMIT</b>	
Less Water and Less Exempt Compounds in Grams per Liter	
Sealant	Current VOC Limit
Architectural	250
Marine Deck	760
Non-Membrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other	420
Sealant Primers	Current VOC Limit
Architectural	250 775
Non-Porous	
Porous	
Modified Bituminous	500
Marine Deck	760
Other	750
For low-solid adhesives or sealants the VOC limit is expressed in grams per liter of material; for all other adhesives and sealants, VOC limits are expressed as grams of VOC per liter of adhesive or sealant less water and less exempt compounds.	

3. Restricted Components: In addition to the specified VOC limits, paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.

## **VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**

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- n. Formaldehyde.
- o. Hexavalent chromium.
- p. Isophorone.
- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

## **PART 3 - EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality, including fines by authorities, due to installation of non-compliant products shall be borne by Contractor.

### **3.2 CERTIFICATION FORM**

- A. Use of this Form:
  - 1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
  - 2. Contractor is required to obtain and submit this Form from each installer of work on this project.
  - 3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
  - 4. If these accessory materials have been used, attach to this form product data and MSDS sheet for each such product.

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**ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM**

IDENTIFICATION:

Project Name: \_\_\_\_\_

Project No.: \_\_\_\_\_

Architect: \_\_\_\_\_

PRODUCT CERTIFICATION: I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

Product data and MSDS sheets are attached.

CERTIFIED BY (Installer/Manufacturer/Supplier Firm):

Firm Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_ (officer of company)

Date: \_\_\_\_\_



**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
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**END OF SECTION**

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compound (voc) restrictions.docx  
Last Updated: January 18, 2022*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Cutting and patching:
    - a. For construction that is defective, or as required to install incomplete work shown in the Contract Documents.
    - b. To extend work or restore existing construction to its original condition, unless otherwise specified or shown on the drawings.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.
- B. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.
- C. Section 01 3516, Alteration Project Procedures.

### **1.3 REFERENCES**

- A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 ADMINISTRATION REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

### **1.5 ACTION SUBMITTALS**

- A. Manufacturer's Data: For products not included in the specifications, submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, and installation instructions.
- B. Samples: As requested by the Architect.

**CUTTING AND PATCHING**  
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C. Request for Cutting and Patching:

1. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
  - a. Work of the Owner or any separate contractor.
  - b. Structural value or integrity of any element of the Project.
  - c. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
  - d. Efficiency, operational life, maintenance or safety of operational elements.
  - e. Visual qualities of sight-exposed elements.
  - f. No cutting of structural elements is allowed unless shown on the Division of the State Architect's approved drawings
2. Request shall include:
  - a. Project identification.
  - b. Description of affected work.
  - c. Necessity for cutting, alteration or excavation.
  - d. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
  - e. Description of proposed work:
    - 1) Scope of cutting, patching, alteration, or excavation.
    - 2) Trades who will execute the work.
    - 3) Products proposed to be used.
    - 4) Extent of refinishing to be done.
  - f. Alternatives to cutting and patching.
  - g. Cost proposal, when applicable.
  - h. Written permission of any separate contractor whose work will be affected.

D. Should conditions of work or schedule indicate change of products from original installation, Contractor shall submit request for substitution.

E. Submit written notice to Architect designating date and time work will be uncovered.

**1.6 INFORMATIONAL SUBMITTALS**

A. Sample of manufacturer's warranty, where applicable.

B. Sustainable Design:

1. General:
  - a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
  - b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
  - a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

**1.7 CLOSEOUT SUBMITTALS**

- A. Warranty/Guarantee: Submit executed warranties and Subcontractors' guarantees for products not included in the specifications.

**1.8 QUALITY ASSURANCE**

- A. Qualifications for Installers:
  - 1. General: As specified in the product specifications.
  - 2. Employ specially qualified installers or fabricators to perform cutting and patching for:
    - a. Weather-exposed or moisture-resistant elements.
    - b. Sight-exposed finished surfaces.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. Single-Source Responsibility: Use materials and products of one manufacturer whenever possible.
- D. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

**1.9 FIELD CONDITIONS**

- A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

**1.10 WARRANTY**

- A. Manufacturer: In addition to the Contractor's and Subcontractor's Guarantee, furnish Owner with manufacturers' available fully executed written warranties for products not included in the specifications against defects in materials and workmanship

**PART 2 - PRODUCTS**

**2.1 DESIGN AND PERFORMANCE CRITERIA**

- A. Sustainable Design:
  - 1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.

**2.2 MATERIALS**

- A. Comply with these specifications, standards and manufacturer's recommendations for each specific product involved.

**CUTTING AND PATCHING**  
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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Inspect conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

**3.2 PREPARATION**

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of Project which may be exposed by cutting and patching work, and maintain excavations free from water.

**3.3 INSTALLATION**

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
  - 1. Removal or cutting of concrete paving shall occur at adjacent expansion joint or control joint.
- B. Execute fitting and adjustment of products to provide finished installation to comply with specified products, functions, tolerances and finishes.
- C. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
- D. Fit work airtight to pipe, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish entire unit.

**3.4 CLEANING AND ADJUSTING**

- A. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

**CUTTING AND PATCHING**  
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- B. Upon completion of installation, thoroughly wash surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition.

**3.5 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

**END OF SECTION**

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*Last Updated: December 16, 2021*

SECTION 01 7419A  
CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN  
(Submit After Award of Contract and Prior to Start of Work)

Project Title:		
Contract or Work Order No.:		
Contractor's Name:		
Street Address:		
City:	State:	Zip:
Phone: ( )	Fax: ( )	
E-Mail Address:		
Prepared by: (Print Name)		

Date Submitted:		
Project Period:	From:	TO:

**Reuse, Recycling or Disposal Processes To Be Used**

*Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:*

- 01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)
- 02 - Salvaging building materials or salvage items at an off site salvage or re-use center (i.e. lighting, fixtures)
- 03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)
- 04 - Recycling source separated materials at an off site recycling center (i.e. scrap metal or green matls)
- 05 - Recycling commingled loads of C&D matls at an off site mixed debris recycling center or transfer station
- 06 - Recycling material as Alternative Daily Cover at landfills
- 07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
- 08 - Disposal at a landfill or transfer station.
- 09 - Other (please describe) \_\_\_\_\_

**Types of Material To Be Generated**

*Use these codes to indicate the types of material that will be generated on the project*

A = Asphalt      C = Concrete      M = Metals      I = Mixed Inert      G = Green Matls  
D = Drywall      P/C=Paper/Cardboard      W/C = Wire/Cable      S= Soils (Non Hazardous)  
M/C = Miscellaneous Construction Debris      R = Reuse/Salvage      W = Wood      O = Other (describe)

Facilities Used: Provide Name of Facility and Location (City)

Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period

Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).

**SECTION I - RE-USED/RECYCLED MATERIALS**

*Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.*

Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
(ex.) M	04	ABC Metals, Los Angeles	24	Tons	Cubic YD	Other Wt.
<b>a. Total Diversion</b>			0	0	0	0

SECTION 01 7419A  
CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN  
Continued

SECTION II - DISPOSED MATERIALS						
<i>Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.</i>						
Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal				0	0	0

SECTION III - TOTAL MATERIALS GENERATED			
<i>This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)</i>			
		Tons	Cubic YD
a. Total Reused/Recycled		0	0
b. Total Disposed		0	0
c. Total Generated		0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION				
<i>Add totals from Section I + Section II</i>				
	Tons	Cubic Yards	Other Wt.	
a. Materials Re-Used and Recycled	0			
b. Materials Disposed	0			
c. Total Materials Generated (a. + b. = c.)	0	0	0	
d. Landfill Diversion Rate (Tons Only)*	#DIV/0!			

*\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled*

<p>Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):</p>
--

<p>Notes:</p> <p>1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)</p> <p style="padding-left: 20px;">Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)</p> <p style="padding-left: 20px;">Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)</p> <p style="padding-left: 20px;">Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)</p> <p style="padding-left: 20px;">Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)</p> <p style="text-align: right; padding-right: 20px;">Drywall Scrap: .20</p> <p style="text-align: right; padding-right: 20px;">Wood Scrap: .16</p>
---



SECTION 01 7419B  
CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT  
(Submit With Each Progress Payment)

Project Title:		
Contract or Work Order No.:		
Contractor's Name:		
Street Address:		
City:	State:	Zip:
Phone: ( )	Fax: ( )	
E-Mail Address:		
Prepared by: (Print Name)		

Date Submitted:		
Period Covered:	From:	To:

**Reuse, Recycling or Disposal Processes Used**

*Describe the types of recycling processes or disposal activities used for material generated in the project. Indicate the type of process or activity by number, types of materials, and quantities that were recycled or disposed in the sections below:*

- 01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)
- 02 - Salvaging building materials or salvage items at an off site salvage or re-use center (i.e. lighting, fixtures)
- 03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)
- 04 - Recycling source separated materials at an off site recycling center (i.e. scrap metal or green matls)
- 05 - Recycling commingled loads of C&D matls at an off site mixed debris recycling center or transfer station
- 06 - Recycling material as Alternative Daily Cover at landfills
- 07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
- 08 - Disposal at a landfill or transfer station.
- 09 - Other (please describe) \_\_\_\_\_

**Types of Material Generated**

*Use these codes to indicate the types of material that were generated on the project*

A = Asphalt      C = Concrete      M = Metals      I = Mixed Inert      G = Green Matls  
D = Drywall      P/C=Paper/Cardboard      W/C = Wire/Cable      S= Soils (Non Hazardous)  
M/C = Miscellaneous Construction Debris      R = Reuse/Salvage      W = Wood      O = Other (describe)

Facilities Used: Provide Name of Facility and Location (City)

Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period

Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).

**SECTION I - RE-USED/RECYCLED MATERIALS**

*Include all recycling activities for source separated or mixed material recycling centers where recycling occurred.*

Type of	Type	Facilities	Total Truck	Total Quantities		
Material	of Activity	Used/Location	Loads	Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
a. Total Diversion			0	0	0	0

SECTION 01 7419B  
CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT  
Continued

SECTION II - DISPOSED MATERIALS						
<i>Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling occurred.</i>						
Type of Material	Type of Activity	Facilities Used/Location		Total Truck Loads	Total Quantities	
					Tons	Cubic YD
(ex.) D	08	DEF Landfill, Los Angeles		2	35	
b. Total Disposal					0	0

SECTION III - TOTAL MATERIALS GENERATED						
<i>This section calculates the total materials generated during the project period (Reuse/Recycle + Disposal = Generation)</i>						
					Tons	Cubic YD
a. Total Reused/Recycled					0	0
b. Total Disposed					0	0
c. Total Generated					0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
<i>Add totals from Section I + Section II</i>						
		Tons	Cubic Yards	Other Wt.		
a. Materials Re-Used and Recycled		0				
b. Materials Disposed		0				
c. Total Materials Generated (a. + b. = c.)		0	0	0		
d. Landfill Diversion Rate (Tons Only)*		#DIV/0!				

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)

Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)

Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

Drywall Scrap: .20

Wood Scrap: .16

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes: Requirements and procedures for ensuring optimal diversion of construction waste materials generated by the Work from landfill disposal within the limits of the Construction Schedule and Contract Sum.
  - 1. The Work of this Contract requires that a minimum of 65% by weight of the construction and demolition materials generated in the Work is diverted from landfill disposal through a combination of re-use and recycling activities.
  - 2. CAL-Green: Alternate waste reduction methods developed in cooperation with local agencies if diversion or recycle facilities capable of compliance with CAL-Green requirements do not exist within the haul boundary of the jobsite (California Code of Regulations, Title 24, Part 11, 5.408).
  - 3. Requirements for submittal of Contractor's Construction Waste and Recycling Plan prior to the commencement of the Work.
  - 4. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments submitted to the Architect.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3516, Alteration Project Procedures.
- B. Section 01 5000, Temporary Facilities & Controls.
- C. Section 01 7329, Cutting and Patching.
- D. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.

### **1.3 REFERENCES AND STANDARDS**

- A. California Green Building Standards Code (CALGreen), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 DEFINITIONS**

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Enforcement Agency (EA).
- B. Construction and Demolition Debris: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous as defined in California Code of Regulations, Title 22, Section 66261.3 et seq. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing

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material, ceramic tile, carpeting, plastic pipe, and steel. The debris may be commingled with rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.

- C. C&D Recycling Center: A facility that receives only construction and demolition debris material that has been separated for reuse prior to receipt, in which the residual (disposed) amount of waste in the material is less than 10% of the amount separated for reuse by weight.
- D. Disposal: Final deposition of construction and demolition or inert debris into land, including stockpiling onto land of construction and demolition debris that has not been sorted for further processing or resale, if such stockpiling is for a period of time greater than 30 days; and construction and demolition debris that has been sorted for further processing or resale, if such stockpiling is for a period of time greater than one year, or stockpiling onto land of inert debris that is for a period of time greater than one year.
- E. Enforcement Agency (EA): Enforcement agency is the authority having jurisdiction within the Project location.
- F. Inert Disposal Facility or Inert Waste Landfill: A disposal facility that accepts only inert waste such as soil and rock, fully cured asphalt paving, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, and ceramics, for land disposal.
- G. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- H. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- J. Reuse. The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- K. Separated for Reuse. Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream for the purpose of additional sorting or processing those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace, and includes materials that have been "source separated".
- L. Solid Waste: All putrescible and nonputrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other

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discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.

- M. Source-Separated: Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation, for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.
- N. Waste Hauler: A company that possesses a valid permit from the local waste management authority having jurisdiction to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

## **1.6 ACTION SUBMITTALS**

- A. Contractor's Construction Waste and Recycling Plan:
  - 1. Review Contract Documents and estimate the types and quantities of materials under the Work that are anticipated to be feasible for on-site processing, source separation for re-use or recycling. Indicate the procedures that will be implemented in this program to effect jobsite source separation, such as, identifying a convenient location where dumpsters would be located, putting signage to identify materials to be placed in dumpsters, etc.
  - 2. Prior to commencing the Work, submit Contractor's Construction Waste and Recycling Plan. Submit in format provided with this specification section. The Plan must include, but is not limited to the following:
    - a. Contractor's name and project identification information;
    - b. Procedures to be used;
    - c. Materials to be re-used and recycled;
    - d. Estimated quantities of materials;
    - e. Names and locations of re-use and recycling facilities/sites;
    - f. Tonnage calculations that demonstrate that Contractor will re-use and recycle a minimum of 65% by weight of the construction waste materials generated by the Work.
  - 3. Contractor's Construction Waste and Recycling Plan must be approved by the Architect prior to the start of Work.

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4. Contractor's Construction Waste and Recycling Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures

**1.7 INFORMATIONAL SUBMITTALS**

**A. Contractor's Reuse, Recycling, and Disposal Report:**

1. Submit Contractor's Reuse, Recycling, and Disposal Report on the form provided with this specification section with each Application & Certificate for Payment. Failure to submit the form and its supporting documentation will render the Application & Certificate for Payment incomplete and delay progress payments. If applicable, include manifests, weight tickets, receipts, and invoices specifically identifying the Project for re-used and recycled materials:
  - a. Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick).
  - b. Salvaging building materials or salvage items at an offsite salvage or reuse center (i.e. lighting, fixtures).
  - c. Recycling source separated materials on site (i.e. crushing asphalt/concrete for base course, or grinding for mulch).
  - d. Recycling source separated material at an offsite recycling center (i.e. scrap metal or green materials).
  - e. Use of material as Alternative Daily Cover (ADC) at landfills.
  - f. Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
  - g. Disposal at a landfill or transfer station (where no recycling takes place).
  - h. Other (describe).
2. Contractor's Reuse, Recycling, and Disposal Report must quantify all materials generated in the Work, disposed in Class III landfills, or diverted from disposal through recycling. Indicate zero (0) if there is no quantity to report for a type of material. As indicated on the form:
  - a. Report disposal or recycling either in tons or in cubic yards. If scales are available at disposal or recycling facility, report in tons; otherwise, report in cubic yards. Report in units for salvage items when no tonnage or cubic yard measurement is feasible.
  - b. Indicate locations to which materials are delivered for reuse, salvage, recycling, accepted as daily cover, inert backfill, or disposal in landfills or transfer stations.
  - c. Provide legible copies of weight tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.
    - 1) Indicate project title, project number, progress payment number, name of the company completing the Contractor's Report and compiling backup documentation, the printed name, signature, and daytime phone number of the person completing the form, the beginning and ending dates of the period covered on the Contractor's Report, and the date that the Contractor's Report is completed.

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3. Demonstrate compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green" 5.408.2, to the satisfaction of the enforcing agency.
  - a. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  - b. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

**PART 2 - PRODUCTS-NOT USED**

**PART 3 - EXECUTION**

**3.1 WASTE MANAGEMENT PLAN**

- A. Implement procedures for disposal of materials, as specified in Contractor's Construction Waste and Recycling Plan, which are not diverted for re-use, salvage or recycling.
  1. Identify materials to be diverted from disposal by efficient usage, recycling, reuse on the project, or salvage for future use or sale.
  2. Determine if materials will be sorted on-site or mixed.
  3. Identify diversion facilities where material collected will be taken.
  4. Specify that quantities of diverted material will be calculated by weight or volume, but not both.

**3.2 SALVAGE, RE-USE, RECYCLING AND PROCEDURES**

- A. Re-use, Salvage, and Recycling Facilities: As specified in Contractor's Construction Waste and Recycling Plan.
- B. Develop and implement procedures to re-use, salvage, and recycle new construction and excavation materials, based on the Contract Documents, the Contractor's Construction Waste and Recycling Plan, estimated quantities of available materials, and availability of recycling facilities. Procedures may include on-site recycling, source separated recycling, and/or mixed debris recycling efforts.
  1. Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.
  2. Source separate new construction, excavation and demolition materials including, but not limited to the following types.
    - a. Asphalt.
    - b. Concrete, concrete block, slump stone (decorative concrete block), and rocks.
    - c. Drywall.
    - d. Green materials (i.e. tree trimmings and land clearing debris).

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- e. Metal (ferrous and non-ferrous).
  - f. Miscellaneous Construction Debris.
  - g. Paper or cardboard.
  - h. Red Clay Brick.
  - i. Reuse or Salvage Materials
  - j. Soils.
  - k. Wire and Cable.
  - l. Wood.
  - m. Other (describe)
3. Miscellaneous Construction Debris: Develop and implement a program to transport loads of mixed (commingled) new construction materials that cannot be feasibly source separated to a mixed materials recycling facility

**3.3 DISPOSAL OPERATIONS AND WASTE HAULING**

- A. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.
- B. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority having jurisdiction.
- C. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, prior to delivering materials.
- D. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
- E. Do not burn, bury or otherwise dispose of solid waste on the project job-site.

**3.4 RE-USE AND DONATION OPTIONS**

- A. Implement a re-use program to the greatest extent feasible. Options may include:
  - 1. California Materials Exchange (CAL-MAX) Program is sponsored by the California Integrated Waste Management Board. CAL-MAX is a free service provided by the California Integrated Waste Management Board, designed to help businesses find markets for materials that traditionally would be discarded. The premise of the CAL-MAX Program is that material discarded by one business may be a resource for another business. To obtain a current Materials Listings Catalog, call CAL-MAX/California Integrated Waste Management Board at (916) 255-2369 or send a FAX to (916) 255-2200. The CALMAX Catalog is available through the Internet Site at <http://www.ciwmb/ca.gov/calmax>.

**3.5 REVENUE**

- A. Revenues or other savings obtained from recycled, re-used, or salvaged materials shall accrue to Contractor unless otherwise noted in the Contract Documents



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**END OF SECTION**

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management and disposal.docx  
Last Updated: December 16, 2021*

**1.1 SUMMARY**

- A. Section Includes: Administrative and procedural requirements for Contract closeout.
- B. These requirements supplement those included in the General Conditions and are subject to modification upon mutual agreement between the Architect, Owner, and Contractor.

**1.2 FINAL CLEANING**

- A. Immediately prior to completion and occupancy, remove marks, stains, fingerprints, dust, dirt and paint drippings resulting from work of this project, including roofs, walls, floors, sidewalks, paving and other finished surfaces.
- B. Contractor shall engage the services of an independent, professional cleaning service to perform final cleaning after Contractor's final clean-up is completed.
- C. Materials:
  - 1. Use only those cleaning materials that will neither create hazards to health or property, damage surfaces, and are in compliance with Proposition 65.
  - 2. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
  - 3. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
  - 4. Use only environmentally acceptable "green" cleaning products.
- D. Remove temporary labels, tags and paper covering.

**1.3 REQUIREMENTS PREPARATORY TO FINAL ACCEPTANCE**

- A. Temporary facilities shall be removed from site.
- B. Plumbing, mechanical and electrical equipment shall operate quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent objectionable noise or vibration. Systems shall operate without humming, surging, or rapid cycling.
- C. Operating instructions for equipment shall be properly mounted and posted.
- D. Training: Provide training and orientation of Owner's operating staff in proper care and operation of equipment, systems and controls including:
  - 1. Fire protection systems.
  - 2. Plumbing equipment.
  - 3. HVAC equipment.
  - 4. Control systems.

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5. Fire alarm systems.
  6. Other systems as required in the specifications or needed to properly instruct Owner's representatives.
  7. Three copies of certificate, signed by the Owner's representative, attesting to their having been instructed.
- E. The following shall be submitted in accordance with Section 01 3300, Submittal Procedures.
1. Completed Record Drawings signed by Contractor and Inspector.
  2. Maintenance and Operating instructions and manuals.
  3. Certifications completed and signed.
  4. Guarantees and warranties as specified and required by the General Conditions.
- F. Contractor's Final Verified Report (Form DSA 6-C) and other Reports and Affidavits required by Division of State Architect shall be submitted; originals and one copy.
- G. Extra Stock shall be delivered and acknowledged by the Owner in quantities specified.

**1.4 PUNCH LIST**

- A. Prior to Architect's punch list, Contractor shall prepare and address initial deficiencies list for all work. Upon completion, this list shall be sent to the Architect.
- B. Contractor shall notify Architect when Contractor, with concurrence of Inspector, feels project is complete enough for preparation of Architect's punch list.
- C. Architect will then notify appropriate consultants including civil, mechanical and electrical engineers, landscape architect, food service designer and others as needed, to make their inspections and prepare "punch lists". Consultant "punch lists" will be completed before Architect will make its "punch list".
- D. Architect will prepare a "punch list".
- E. Punch lists will be published within 14 days of Architect's walk through.
- F. Work on the punch list, except minor items as determined by the Architect, shall be completed prior to completion and occupancy.

**1.5 FINAL ACCEPTANCE**

- A. After requirements preparatory to Final Acceptance have been completed as hereinbefore specified, Contractor shall notify Architect to perform acceptance tour. Notice shall be given at least three days in advance of the time the acceptance tour is to be performed.
- B. Contractor or its principal superintendents authorized to act in behalf of Contractor, shall accompany Architect and Inspector on acceptance tour, as well as any principal subcontractors that Architect may request to be present.

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- C. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will recommend Final Acceptance to the Owner and initiate the filing of the Notice of Completion.
- D. If work has been substantially completed in accordance with Contract Documents, and only minor corrective measures are required, Architect will recommend that Owner conditionally accept Project and file Notice of Completion based upon Contractor's assurance that corrective measures will be completed within shortest practicable time period (but absolutely not later than 30 days).
- E. If work has not been substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend one or the other of the following:
  - 1. That Owner accept Project and file Notice of Completion only upon receiving from Contractor a Cashier's Check in amount sufficient to account for corrective measures still required, in the event that Owner had to have others complete the work.
  - 2. That Owner not accept project and not file Notice of Completion. Instead, based on information gathered from acceptance tour, Contractor will be required to complete all corrective measures and then call for another project acceptance tour following procedure outlined above.
- F. Should any corrective measures remain incomplete at time final payment is due, Contractor shall provide Owner with Money Order(s) or Cashier's Check in exchange for retention. Money Order(s) or Cashier's Check shall be in an amount one and one-half times the agreed estimated cost as determined by the Architect.
- G. Upon Final Acceptance of Project by Owner, Contractor shall submit his request for final payment, less retention. Retention payment will not be made by Owner until 35 days after board acceptance and filing of Notice of Completion with County Recorder, as specified in General Conditions.
- H. Retention payment will not be made until Contractor has filed the required Form DSA 6-C with DSA with two original copies to the Architect.

**1.6 CLOSEOUT CHECKLIST**

- A. The following items are to be fully completed and/or submitted as a condition for final acceptance of the project (as applicable)
  - 1. Specifications and Plans Review for Closeout
  - 2. Fire Alarm System Certification
  - 3. Megger Grounding Test Certificate
  - 4. Certificate of Compliance for Building Materials
  - 5. Contractor's Reuse, Recycling and Disposal Report
  - 6. Environmental Product Certification as required under Section 01 3543
  - 7. Indoor Air Quality Report (Section 01 3543)

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8. Certifications as required under Section 01 3300.
9. Air Balance Report
10. Operation & Maintenance Manuals
11. Guarantees/Warranties
12. Training
13. Record Drawings
14. Labels and name plates on all electrical panels
15. Keys (from Contractor - properly labeled):
  - a. electrical panel keys
  - b. communication panel keys
  - c. all cabinet keys
  - d. extra door keys as required by specifications
16. Punch List Items Completed
17. Extra Stock of Specified Items, delivered to Owner (including documents)
18. Back charges Resolved
19. Removal of Stop Notices
20. Contractor's Final Verified Reports (DSA 6-C)

**END OF SECTION**

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procedures.docx  
Last Updated: July 13, 2018*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for explicit warranties, guarantees, bonds, and service and maintenance contracts specified in the individual Sections and supplementing the requirements included in the General Conditions.
  - 2. Guarantee and warranty period inspections.
  - 3. Forms for Guarantees/Warranties.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3300, Submittal Procedures; additional requirements and submittal procedures for guarantees/warranties.

### **1.3 DEFINITIONS**

- A. General: The following definitions apply to the language used in these Specifications.
- B. Warranty: A representation or affirmative covenant that the work will be performed in accordance with certain standards stated in the Contract, such as in "a good and workmanlike manner," and otherwise be free of defects and in conformity with the Contract Documents for the duration noted or, if a duration is not indicated, the statute of limitations period for contract breaches will constitute the time frame for enforcement.
- C. Guarantee: A provision of the warranty which becomes operative after completion of the work under the Contract and requires replacement of defective or non-conforming materials or equipment, or remedy improper workmanship, at the guarantors own cost and expense, for the duration noted under the General Conditions of the Contract or in the Specifications.
- D. Standard Product Guarantees/Warranties: Preprinted written documents published by individual manufacturers for particular products and specifically endorsed by the manufacturer to the Owner.
- E. Contractor Standard Guarantee: The Contractor's guarantee for the term included in the General Conditions.
- F. Subcontractor Standard Guarantee: A Subcontractor's guarantee period that coincides with the term of the Contractor's guarantee included in the General Conditions.
- G. Special Guarantees/Warranties: Written guarantees/warranties required by or incorporated in the Contract Documents to be provided by the Contractor or its Subcontractors to either extend time limits of the Standard Guarantees/Warranties included in the General Conditions or to provide greater rights for the Owner.

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**1.4 GENERAL REQUIREMENTS**

- A. Guarantees/warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect those issued to the Owner.
- B. Contractor shall not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others nor shall it be responsible for damaged parts whose replacement is necessitated by failure of Owner's maintenance forces to properly clean and service them, provided that Contractor has furnished complete operating and maintenance instructions to Owner.
- C. By terms of each guarantee/warranty, unless otherwise specified or stipulated, also agree to remove and replace other work, as required, that has been connected to or superimposed on substrate material to be replaced.
- D. In addition to other requirements specified:
  - 1. Compile specified service and maintenance contracts.
  - 2. Coexecute submittals when specified.
  - 3. Review submittals to verify compliance with Contract Documents.
  - 4. Submit to Architect for review and transmittal to Owner.
- E. In case of items remaining incomplete after date of filing of the Notice of Completion, the guarantee/warranty period shall run from the date of acceptance of such items.
- F. Special guarantees/warranties applicable to definite parts of the Work and as specifically stipulated in the respective Sections of the Specifications or other Contract Documents shall be subject to the terms of this Section.
- G. If repairs or changes are required in connection with the work within a guarantee/warranty period, the Contractor shall, promptly upon receipt of notice from the Owner and without expense to the Owner, comply with the following:
  - 1. Correct defects and place in satisfactory condition the work covered by the respective guarantee/warranty.
  - 2. Repair, to the satisfaction of the Owner, damage to the Buildings and/or site that is the result of the cause for said repairs and changes.
  - 3. Repairs and corrective work shall be made to the satisfaction of the Owner including the equipment and contents of the Buildings and/or site disturbed during performance of the guarantee/warranty work.
- H. The Owner may, at its sole discretion, proceed with the correction work at Contractor's expense if Contractor does not proceed with the corrective work within a reasonable time fixed by a written notice from the Owner.
  - 1. As part of the corrective work, the Owner reserves the right to remove and store or dispose of defective equipment or material at Contractor's expense.
  - 2. If Contractor does not pay the costs of such removal and storage within ten days thereafter, the Owner may, upon ten additional days' written notice, sell such

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defective items and shall account for the net proceeds after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's additional services.

3. If the proceeds from the sale are insufficient to cover all amounts chargeable to Contractor, Contractor shall pay the difference to the Owner.
- I. If repairs or changes are required in connection with guarantee/warranty work and notice is given within the guarantee/warranty period, the warranty shall continue until the corrective work has been completed, regardless of the termination of the specified guarantee/warranty period.
- J. In case of work performed by subcontractors and where a special guarantee/warranty is required, guarantees/warranties addressed to and in favor of the Owner shall be secured from said subcontractors.
- K. No provision in the Contract Documents or in any special or general guarantee/warranty shall be held to limit, as to time or scope of liability, the Contractor's liability for defects or the liability of its sureties to less than the legal limit of liability under laws having jurisdiction.
- L. The delivery of any guarantees/warranties shall not relieve the Contractor from any obligation assumed under any other provision of the Contract Documents.
- M. The obligation of the Contractor under this Section shall survive the termination of the Contract.

**1.5 SUBMITTAL REQUIREMENTS**

- A. Assemble guarantees/warranties, bonds, and service and maintenance contracts executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Format:
  1. Size: 8-1/2-inch-by 11-inch sheets, punched for three-ring binder. Fold larger sheets to fit into binders.
  2. Binders: Commercial quality, three-ring, "View" type, with durable and cleanable plastic covers.
  3. Cover: Identify each packet with typed or printed title, "GUARANTEES/WARRANTIES," and list the title of Project and name of Contractor.
- C. Contents:
  1. Neatly typed, in orderly sequence.
  2. Provide complete information for each item including:
    - a. Product or work item.
    - b. Firm name with name of principal, address, and telephone number.
    - c. Beginning date and duration of warranty, bond, or service and maintenance contract.



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3. Provide the following information for Owner's personnel:
    - a. Proper procedure in case of failure.
    - b. Circumstances that might affect the validity of guarantee/warranty or bond.
  4. Contractor's name, name of responsible principal, address, and telephone number.
- D. Refer to Section 01 3300, Submittal Procedures, for additional requirements.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 TIME OF SUBMITTALS**

- A. Typical: Within 30 days after filing date of Notice of Completion.
- B. Equipment or component parts of equipment put into service during progress of construction; submit documents within 10 days after inspection and acceptance.
- C. Items of work, where acceptance is delayed materially beyond date of filing date of Notice of Completion; provide updated submittal within 14 days after acceptance, listing date of acceptance as start of guarantee/warranty period.

**3.2 GUARANTEE PERIOD INSPECTIONS**

- A. Contractor and subcontractors performing the construction work are required to guarantee workmanship and materials for the period noted in the Contract. Within a month of the end of such guarantee period, Contractor's agent shall prepare an inspection report indicating the condition of the Owner's facility and related common facility, itemizing the work to be completed, performed and/or corrected. Such guarantee period shall be continued in effect and extended until such time as Owner submits to Contractor written confirmation of the satisfactory completion of the itemized work, which confirmation shall be submitted within a reasonable period of time.

**3.3 GUARANTEE/WARRANTY FORMS**

- A. Contractor Standard Guarantee: Submit the following written Standard Guarantee/Warranty form for the overall Work against defects in materials and workmanship for the period of guarantee/warranty required under the Contract after the filing of the Notice of Completion (included with this section).
- B. Subcontractor Standard Guarantee: Submit the following written Standard Guarantee/Warranty form for Subcontracted Work against defects in materials and workmanship for the period of guarantee/warranty required under the Contract after the filing of the Notice of Completion (included with this section).
- C. Subcontractor Special or Extended Guarantee/Warranty: Contractor shall have its Subcontractor submit the following Special Extended Written Guarantee/Warranty, typed

**WARRANTIES**  
**SECTION 01 7836**  
**3431004**

on Subcontractor's letterhead, when required by a Specification Section for a period in excess of 2 years (included with this section).

**END OF SECTION**

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*Last Updated: February 13, 2019*

*(Letterhead of Contractor)*

STANDARD GUARANTEE / WARRANTY

for

\_\_\_\_\_  
Project Name

\_\_\_\_\_  
Contract No.

We hereby warrant that the Work we have provided under the above reference Contract has been completed in accordance with the Drawings, Specifications, and other Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within the period of 24 months from the date of filing of the Notice of Completion of the above named Project by the Board of Trustees of the School District, and we also agree to repair any and all damages resulting from such defects, without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with above-mentioned guarantee conditions within ten (10) day after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Contractor) \_\_\_\_\_

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Printed Name of Authorized Representative)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

COUNTERSIGNED (Owner) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Authorized Representative)

\_\_\_\_\_  
Signature

Date of Filing or Notice of Completion: \_\_\_\_\_

(Letterhead of Company)

SUBCONTRACTOR STANDARD GUARANTEE / WARRANTY

We hereby warrant that

\_\_\_\_\_

which we have provided in \_\_\_\_\_

for \_\_\_\_\_

Name of Project

District

has been completed in accordance with Specification Section \_\_\_\_\_ and requirements of the Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within a period of 24 months from date of filing the Notice of Completion of the above-named Project by the Board of Trustees of the School District without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with above-mentioned guarantee conditions within ten (10) day after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Subcontractor)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Company Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

COUNTERSIGNED (General Contractor)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Company Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

(Letterhead of Company)

SPECIAL EXTENDED WRITTEN GUARANTEE / WARRANTY

We hereby warrant that

\_\_\_\_\_

which we have provided in \_\_\_\_\_

\_\_\_\_\_  
Name of Project

for \_\_\_\_\_

\_\_\_\_\_  
District

has been completed in accordance with Specification Section \_\_\_\_\_ and requirements of the Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within a period of \_\_\_\_\_ year(s) from date of filing the Notice of Completion of the above-named Project by the Board of Trustees of the School District without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted. We also agree to repair any and all damages resulting from such defects.

In the event of our failure to comply with above-mentioned conditions within a reasonable time but in no case longer than ten (10) calendar days after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Subcontractor)

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

COUNTERSIGNED (General Contractor)

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes general requirements and procedures for compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".

- 1. Chapter 5- Non-Residential Mandatory Measures.

### **1.2 RELATED REQUIREMENTS**

- A. Pertinent sections specifying erosion control.
- B. Section 01 3543, Environmental Procedures.
- C. Section 01 6116, Volatile Organic Compound (VOC) Restrictions.
- D. Section 01 7419, Construction Waste Management and Disposal.
- E. Section 01 7700, Closeout Procedures.
- F. Pertinent sections specifying landscape irrigation.

### **1.3 DEFINITIONS**

- A. CAL-Green Definitions: Certain terms are defined by CAL-Green in Chapter 5 of the code. Words and terms used in this section shall have the meanings shown therein.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Respond to questions and requests from Architect and the jurisdiction having authority regarding CAL-Green credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures. Document responses as informational submittals.

### **1.5 SUBMITTALS**

- A. CAL-GREEN Submittals: Submit CAL-GREEN submittals required by code and in other Specification Sections.
  - 1. CAL-GREEN submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CAL-GREEN requirements.
  - 2. Acceptable verification submittals are specified in the related sections.

**SUSTAINABLE DESIGN REQUIREMENTS**  
**SECTION 01 8113.10**  
**3431004**

**PART 2 - PRODUCTS**

**2.1 REQUIREMENTS - GENERAL**

- A. Provide products and procedures necessary to confirm CAL-GREEN compliance required in this Section. Although other Sections may specify some CAL-GREEN requirements, the Contractor shall determine additional materials, techniques, means, methods and procedures necessary to comply with CAL-GREEN requirements.

**2.2 CONSTRUCTION WASTE REDUCTION**

- A. Section 5.408 Construction Waste Management, Diversion and Recycling: Comply with requirements of this code section, local ordinances and Section 01 7419.

**2.3 BUILDING MAINTENANCE AND OPERATION**

- A. Section 5.410.2.5. Documentation and Training: Provide Operations Training as required by these code sections and as specified in Section 01 7700 and Systems Manual as specified in Section 01 7700.

**2.4 POLLUTANT CONTROL**

- A. Section 5.504.3 Indoor Air Quality: Comply with requirements of this code section, local ordinances and Section 01 3543.
  - 1. During storage, rough installation and until final start-up of HVAC equipment, securely cover all ducts and air distribution component openings with plastic, tape, sheet metal or other methods acceptable to enforcing agency to reduce dust or debris collected in the system.
- B. Section 5.504.4 Finish Material Pollutant Control: All Finish materials shall comply with requirements of this code section, local ordinances and Section 01 6116.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Comply with Section 01 7419, Construction Waste Management and Disposal.
- B. Comply with execution requirements of related sections and applicable local codes and ordinances.

**END OF SECTION**

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*Last Updated: April 8, 2019*

**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Rough carpentry.
- B. Related Sections:
  - 1. Section 01 35 42, CALGreen Requirements.

**1.02 REFERENCE STANDARDS**

- A. Conform to current adopted reference standards by date of issue of the current code cycle and the date of the Contract Documents.
- B. ASTM International:
  - 1. ASTM D 3498 - Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
  - 2. ASTM D 4601 - Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
  - 3. ASTM E 84 - Surface Burning Characteristics of Building Materials.
- C. CBC - California Building Code, 2022
- D. California Green Building Standards Code, CALGreen - 2022.
- E. DOC PS 1 - Department of Commerce Product Standard, U. S. Product Standard for Construction and Industrial Plywood.
- F. DOC PS 20 - Department of Commerce Product Standard, American Softwood Lumber Standards.
- G. DOC PS 2 - Department of Commerce Product Standard, U. S. Product Standard for Construction, Performance Standard for Wood-Based Structural-Use Panels.
- H. ANSI A135.4 - Basic Hardboard.
- I. WWPA - Western Lumber Grading Rules 88, Latest Edition, by Western Wood Products Association.
- J. HPVA HP-1 - American National Standard Institute, Hardwood Plywood and Veneer Association.
- K. APA - The Engineered Wood Association. The Construction Guide.



- L. AWWA C1, C2, C3, C9, C27 - American Wood Preservers Association - Manual of Recommended Practice.
- M. AWWA C20 - American Wood Preservers Association Standards, Structural Lumber - Fire-Retardant Treatment by Pressure Process.
- N. WCLIB - West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.
- O. Title 8 - California Code of Regulations, Construction Safety Orders.
- P. ICC - ES - International Code Council Evaluation Service, Inc. Legacy Reports.
- Q. RIS - Redwood Inspection Service, Standard Specifications for Grades of California Redwood Lumber.
- R. Local AQMD - Local Air Quality Management District Regulations.

### 1.03 SUBMITTALS

- A. Product Data: For the following:
  - 1. Product Data and current ICC Legacy Reports.
- B. Material Certificates.
- C. CALGreen Submittals:
  - 1. Product Data Sheets and Declaration Statements showing compliance with CALGreen Code per 1.04.A.

### 1.04 QUALITY ASSURANCE

- A. California Green Building Standards Code, CALGreen - 2022.
  - 1. Adhesives, sealants, primers, and caulks shall comply with air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits, per CALGreen Tables 5.504.4.1 and 5.504.4.2.
  - 2. Paints and Coatings shall comply with VOC limits in Table 1 of the ARB, per CALGreen Table 5.504.4.3.
  - 3. Composite wood products (plywood, particle board, medium density fiberboard) shall comply with Formaldehyde limits per CALGreen Table 5.504.4.5.
- B. Rough Carpentry Lumber: Visible grade stamp on all products required.
- C. Grade Stamp: Association under whose rules it was graded, or official grade mark of other recognized grading agencies using grading rules, equivalent to WWPA or WCLIB.
- D. Association performing grading and grade marking of lumber shall be approved by Architect and Division of the State Architect.

- E. Nailing guns and nail operators shall be approved in accordance with Title 8 Construction Safety Orders.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver rough carpentry items until site conditions are adequate to receive the Work. Protect items from weather while in transit.
- B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raise above ground and out of contact with damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around stacks and under temporary covers. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.
- C. Install bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles materials, erection equipment or other loads are carried by frame during its erection.

#### 1.06 FIELD CONDITIONS

- A. Cooperate with other trades in coordinating their Work with the Work of this Section. Provide wood grounds, blocking and nailer where indicated or as required for Work of other trades.

### PART 2 - PRODUCTS

#### 2.01 ROUGH CARPENTRY MATERIALS

- A. Lumber: Graded in accordance with WWPA or WCLIB; maximum moisture content of 19 percent at time of installation. Provide Douglas Fir Larch for structural and framing lumber, surfaced four sides to standards of the grading association unless otherwise indicated on Drawings, use the following grades:
  - 1. Joists, rafters, beams, lintels, horizontal framing, posts, studs and vertical framing: No. 1 unless otherwise indicated or noted on drawings.
  - 2. Non-bearing studs and plates, non-structural furring, concealed blocking, stripping and miscellaneous nailers and backing: No. 2 unless noted otherwise in the structural drawings.
  - 3. Structural Drawings take precedence for lumber grades.
  - 4. All lumber in contact with concrete shall be pressure treated.
- B. Plywood: CBC Section 2303.3 and 2304.6, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification; Exposure 1 plywood grade. Thickness as indicated, span rating sized for spacing.

1. For painted finish for interior and exterior: APA Sanded Plywood Panels, Panel Grade A-C, Group 1, Exterior plywood grade, sanded face, touch sanded back side.
  2. Exposure 1 plywood grade: "CDX", Structural I, C-D.
- C. Roof Plywood Decking: requiring FM 1-90 Wind and Fire Classification, minimum 1/2" thick. CBC Section 2304.8, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification: Exposure 1, B-C Veneer Grade, sanded 1 side. Thickness as indicated, span rating sized for spacing.
- D. Board Roof Decking: 2 x 6 Douglass Fir, kiln dry, #1 Grade Lumber, Tongue and Groove, surfaced one side.
- E. Preservative (Pressure) Treated Lumber: Section 2303.1.9 Conform to AWWPA Manual of Recommended Practice, kiln dry after treatment. Use preservative complying with AWWPA C2 lumber and C9 plywood, latest edition. Products NOT containing arsenic or chromium. Conform to AQMD, Local Regulations.
1. Douglas Fir Larch, used as required by Section 2303.1.9.1, CBC, shall conform to the following:
    - a. Lumber shall be WWPA or WCLIB grade stamped.
    - b. Lumber shall be No. 1 grade or better unless indicated otherwise on Drawings.
- F. Plywood Backing Panels - Backboards:
1. Telephone and Electrical Equipment backboards, fixed equipment, cabinets, grab bars, door stops and plates: DOC PS 1, Exposure 1, APA A-C, sanded, Veneer Grade, fire-retardant treated, in thickness indicated or, if not indicated, not less than 5/8-inch nominal thickness. Installed "A" side out for paint finish.

## 2.02 ACCESSORIES

- A. Nails, Spikes and Staples: Section 2304.10 CBC, Galvanized for exterior applications, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application. Comply with Table 2304.10.1. Use common nails only.
- B. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.10 CBC, sized to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations. Full diameter body bolts only per ASME B18.2.1(.2) or B18.2.6 for structural applications.
- C. Soffit vents: Soffit Vents: Extruded aluminum material, 4-inch soffit vent unless otherwise noted on drawings. By Belmont, CA, Flannery, Inc., San Fernando, CA, Fry Reglet Company, Alhambra, CA, or equal.
- D. Expansion type or powder actuated type for anchorage to solid masonry or concrete.
1. Kwik Bolt TZ2 (KB-TZ2) Concrete Anchor, 3/8- to 3/4-inch diameter, ICC-ES ESR-4266, by Hilti Inc., Tulsa, OK. Or Strong-Bolt 2 concrete anchor, 1/2, 5/8, 3/4 and 1 inch diameter, ICC-ES ESR-3037, by Simpson Strong-Tie, Pleasanton, CA. Or equal with ICC Report Number.

2. Kwik Bolt TZ2 (KB-TZ2) 1/4- to 3/4-inch diameter, ICC-ES ESR-4561, by Hilti. Or equal with ICC Report Number.
- E. Stock Framing Connectors: Section 2304.10 CBC types indicated on Drawings, galvanized, with nails fully driven in all holes in each face of connector. Conform to the following.
    1. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, United Steel Products, Montgomery, MN. or equal.
  - F. Non-Stock Framing Connectors: Conform to details.
  - G. Nonshrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time. Acceptable Manufacturers: Dayton Superior, Miamisburg, OH; Sonneborn, Shakopee, MN; Novex Systems International, Clifton NJ, or equal.
  - H. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
  - I. Adhesives: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
    1. Adhesives shall comply with Local AQMD and California VOC Regulations.

## PART 3 - EXECUTION

### 3.01 LAYOUT MARKINGS

- A. Layout markings shall not be made with xylene-based inks, paint, or dyes, or with other solvent-based products that may bleed through finishes.

### 3.02 FRAMING, FURRING AND STRIPPING

- A. Erect wood framing, furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch in 10 feet, non-cumulative.
- B. Construct members of continuous pieces of longest possible lengths.
- C. Construct and erect required headers and lintels.
- D. Double wall framing members at openings over 100 square inches. Space short members above and below openings in same manner as for walls.
- E. Provide double joist headers at joist ends and around openings unless otherwise indicated on Drawings. Bridge joists and rafters to conform CBC Section 2306.1.1 and as noted on plans. For pre-manufactured joists, provide bridging in accordance with manufacturer's recommendations.

- F. Construct walls with studs of size and spacing indicated, 16 inches on center unless otherwise indicated on drawings. Install single sill member at bottom and double plate at top. Stagger upper and lower members of double plate with joints not less than 4 feet o.c. or as indicated on Drawings. Where sill or any wood member contacts concrete or masonry, install preservative-treated lumber.
- G. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at ceiling and floor lines and at spacing not to exceed 8 feet on center vertically. Fit snugly and attach with not less than two 16d nails.
- H. Install 3 studs at corners.
- I. Conform to CBC Section 2308.5.8, where pipes penetrate sills or plates.
- J. Cutting and Notching: Conform to CBC Section 2308.5.9.
- K. Bored Holes: Conform to CBC Section 2308.5.10.
- L. Conform to CBC Section 718 for fire blocks and draft stops. Fire blocks and stops at 10-foot intervals and at ceiling level.
- M. Fire-Retardant Wood: Ripping and milling are not permissible. Cross cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating. All cuts on plywood are considered end cuts and is permissible to be cut.

### 3.03 2 X ROOF DECKING

- A. Place floor decking] with end joints staggered. Secure boards over firm bearing. Maintain tight spacing between joints of boards. Place diagonal to framing members of rafters or joists.
- B. Maintain surface flatness of maximum 1/8 inch in 10 ft.
- C. Fit edges tight and secure with nails.

### 3.04 PLYWOOD SHEATHING

- A. Thickness as indicated on the Drawings, minimum thickness 1/2 inch.
- B. Boundary Nailing: Not less than 3/8 inch from edge, spaced not more than 6 inches on center, unless noted otherwise on Drawings.
- C. Blocking: Panel edges shall bear on framing members or solid blocking.
- D. Minimum Size Vertical Panel: 16 inches wide.
- E. Minimum Size Horizontal Panel: 24 inches wide.

- F. Oriented Strand Board not permitted for shear panels unless indicated on structural drawings.

### 3.05 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.

### 3.06 HORIZONTAL FRAMING

- A. Bearing: 1-1/2-inch minimum on wood or metal, 3 inches on masonry. Lay framing members with crown up. Members with knots at bottom not permitted.
- B. Lateral Support: Use solid blocking, cross bridging or other approved means.
- C. Lap joists a minimum of 3 inches when framed from opposite sides of a beam. Do not run joists continuous beyond one span unless indicated otherwise on Drawings.
- D. Openings: Double joists required for trimmer and headers for openings 4 ft. or larger unless indicated otherwise on Drawings.
- E. Provide ties, purlins and blocking in conformance with CBC Sections 2308.8.5.
- F. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

### **END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Electric motors.
  - 2. Gauges.
  - 3. Access Doors.
  - 4. Flexible joints.
  - 5. Insulation.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 22 Section.

### **1.3 ADDITIONAL REQUIREMENTS**

- A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.
- C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

### **1.4 REFERENCES AND STANDARDS**

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. CSA – Canadian Standards Association International.
  - 2. ANSI - American National Standards Institute.
  - 3. ASTM - American Society for Testing and Materials.
  - 4. CCR - California Code of Regulations.
    - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
  - 5. NCPWB - National Certified Pipe Welding Bureau.
  - 6. CEC - California Electrical Code.
  - 7. NEMA - National Electrical Manufacturers' Association.

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8. NFPA - National Fire Protection Association.
9. OSHA - Occupational Safety and Health Act.
10. UL - Underwriters' Laboratories, Inc.

**B. Requirements of Regulatory Agencies:**

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
  - a. California Building Code, 2022.
  - b. California Electrical Code, 2022.
  - c. California Energy Code, 2022.
  - d. California Fire Code, 2022.
  - e. California Green Building Standards Code, 2022.
  - f. California Mechanical Code, 2022.
  - g. California Plumbing Code, 2022.
  - h. California Code of Regulations, Title 24.
  - i. California Health and Safety Code.
  - j. CAL-OSHA.
  - k. California State Fire Marshal, Title 19 CCR.
  - l. National Fire Protection Association.
  - m. Occupational Safety and Health Administration.
  - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

**1.5 DRAWINGS**

- A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
  1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
  2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations



- shown. Obtain the Architects approval prior to relocation of equipment and materials.
3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

## **1.6 FEES AND PERMITS**

- A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.
- C. Coordination:
1. General:
    - a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

**BASIC PLUMBING MATERIALS  
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3431004**

- 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
3. Mechanical Coordination:
  - a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
  - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
  - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
  - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

**1.7 SUBMITTALS - GENERAL**

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
  6. Organize submittals in same sequence as in Specification Sections.
  7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation

and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

- a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
  - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
  - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

## **1.8 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
  1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
  2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

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- D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 6875. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 6875.
- E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
  - 1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
  - 2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
  - 3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
    - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient  $I_p = 1.5$  shall be used for gas piping bracing calculations.
    - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2019 California Building Code
  - 4. Additional Requirements: In addition to the above, conform to all state and local requirements.

**1.9 INFORMATIONAL SUBMITTALS**

- A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 8000. Comply with requirements for layouts specified in Section 23 8000.

**1.10 CLOSEOUT SUBMITTALS**

**A. Operation and Maintenance Data:**

1. Refer to Division 01 for complete instructions.
2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
    - 6) Copies of guarantees/warranties for each item of equipment and systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Control diagrams and literature.
    - 11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
    - 12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
    - 13) Commissioning and Preliminary Operation Tests required as part of the Work.
  - b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

**B. Record Drawings:**

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.

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- b. One complete set of reproducible drawings showing the Work exactly as installed.
- c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
- d. Provide Contractor's signature, verifying accuracy of record drawings.
- e. Obtain the signature of the Project Inspector for all record drawings.

**1.11 SUBSTITUTIONS**

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  - 1. Reason for substitution request.
  - 2. Complete submittal information as described herein; see "Submittals."
  - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  - 5. Explanation of impact on connected utilities.
  - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.
- G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

**1.12 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.
- C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 6875.
- D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.
- E. All materials and products shall be new and shall match existing.

**1.13 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

**1.14 FIELD CONDITIONS**

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

**1.15 WARRANTY**

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

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**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

**2.2 MATERIALS AND PRODUCTS**

- A. No material installed as part of this Work shall contain asbestos.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

**2.3 GAUGES**

- A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

**2.4 ACCESS DOORS**

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  - 1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.



- E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  - 1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## **2.5 EQUIPMENT IDENTIFICATION**

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## **2.6 PIPE IDENTIFICATION**

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

## **2.7 INSULATION WORK**

- A. General:
  - 1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
  - 2. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
  - 3. The term "piping" used herein includes pipe, valves, strainers and fittings.
  - 4. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - 5. Provide pre-formed PVC valve and fitting covers.
  - 6. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
  - 7. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

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8. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
9. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

**B. Insulation of Piping:**

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
  - a. Pipe 3/4 inches and smaller: 1 inch thick.
  - b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
  - c. Pipe 2 inches and larger: 2 inches thick.
2. Insulate domestic hot water piping under slab on grade and cold water piping exposed to the weather with 3/4 inch thick Therma-Cel, Armaflex, or equal; seal water tight per manufacturer's directions.
3. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
4. Insulate domestic cold water piping outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
5. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
7. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
  - a. Fitting covers:
    - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 2) Tee covers.

- 3) Flange and union covers.
- 4) End caps.
- 5) Beveled collars.
- 6) Valve covers.
- 7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- b. Jacket thickness:
  - 1) Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
  - 2) Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

### **PART 3 - EXECUTION**

#### **3.1 EXISTING MATERIALS**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.
- D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

#### **3.2 FRAMING, CUTTING AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

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- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

**3.3 PLUMBING DEMOLITION**

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
  - 3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

**3.4 ELECTRICAL REQUIREMENTS**

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### **3.5 PIPING SYSTEM REQUIREMENTS**

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

### **3.6 PRIMING AND PAINTING**

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and Painting:
  - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
    - a. Black Steel Piping:
      - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
      - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
  - 3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

### **3.7 EXCAVATING**

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for

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pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

**3.8 BACKFILLING**

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

**3.9 PIPING SYSTEMS INSTALLATION**

- A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

**B. General:**

1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
3. Install piping to permit application of insulation and to allow valve servicing.
4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

**C. Floor, Wall, and Ceiling Plates:**

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1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

**D. Firestopping:**

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

**E. Flashing:**

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.



**F. Hangers and Supports:**

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.
  - a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
    - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Note 3)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

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- 1) Note 1: Provide mid-story guides.
  - 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
  - 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.
- c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
  - 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
  - 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.
- d. Horizontal cast iron piping support spacing:
- 1) Support piping at every other joint for piping length of less than 4 feet.
  - 2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
  - 3) Hanger shall not be installed on the coupling.
  - 4) Provide support at each horizontal branch connection.
  - 5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
  - 6) Provide a brace on each side of a change in direction of 90 degrees or more.

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5. Suspended Piping:

- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Steel Connectors: Beam clamps with retainers.

6. Support to Structure:

- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
- 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062	MSS Type 34
Side Beam Angle Clip	B-Line B3060	
Ceiling Flange	B-Line B3199	

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through

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- 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
7. Rubber Neoprene Pipe Isolators:
- a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

**3.10 UNION AND FLANGE INSTALLATION**

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 6875.
- B. Install unions in piping NPS 2" and smaller, and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 6875.
- C. Locate the unions for easy removal of the equipment, tank, or valve.

**3.11 ACCESS DOOR INSTALLATION**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers,

traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### **3.12 CONCRETE WORK**

- A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.
- B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

### **3.13 PIPE PROTECTION**

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  - 1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
  - 2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  - 1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

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- E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.
- F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer's recommendations and instructions.
- G. Sleeve cast iron and ductile iron pipe below grade and below slab with "Polywrap" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer's recommendations and instructions.
- H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

**3.14 PIPE IDENTIFICATION**

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Apply markings after painting and cleaning of piping and insulation is completed.

**3.15 EXPANSION ANCHORS IN HARDENED CONCRETE**

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

- D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

### **3.16 PIPING SYSTEM PRESSURE TESTING**

- A. General:
  - 1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
  - 2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:
  - 1. Authority having jurisdiction shall witness tests of piping systems.
  - 2. Notify Architect at least seven days in advance of testing.
  - 3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
  - 4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
  - 5. Isolate from system equipment that may be damaged by test pressure.
  - 6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
    - a. Authority having jurisdiction shall witness final connection to system.
- C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.
- D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

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<u>System Tested</u>	<u>Test Pressure PSI</u>	<u>Test With</u>
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Natural Gas (PE)	60	Air & Non-corrosive Leak Test Fluid
Natural Gas (Steel)	100	Air & Non-corrosive Leak Test Fluid
Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

1. Flush deionized water lines with deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

**3.17 OPERATION OF SYSTEMS**

- A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
  1. Complete all requirements listed under "Check, Test and Start Requirements."
  2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  3. Filters, strainers etc. are in place.
  4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

**3.18 CHECK, TEST AND START REQUIREMENTS**

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.



1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

### **3.19 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS**

- A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
  2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Missing or damaged parts have been replaced.
  7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  10. Preliminary test and balance work is complete, and reports have been forwarded for review.
  11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.

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12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- D. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- E. Preliminary Operation:
1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

**3.20 CERTIFICATES OF INSTALLATION**

- A. Contractor shall complete applicable "Certificates of Installation" forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

**3.21 DEMONSTRATION AND TRAINING**

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

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1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
  - a. Listing of Owner-designated personnel completing training, by name and title.
  - b. Name and title of training instructor.
  - c. Date(s) of training.
  - d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Valves.
  - 3. Domestic water piping specialties.
  - 4. Gas piping specialties.
  - 5. Drain and waste piping specialties.

**1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 0050 Basic Plumbing Materials and Methods.

**1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

**1.4 INFORMATIONAL SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Provide welding certificate for all gas pipe welders.
- C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

**1.5 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

**1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

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**1.7 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.
- C. NFPA/ANSI Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."
- D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- E. Fabricate and install natural gas systems in accordance with California Plumbing Code.
- F. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

**PART 2 - PRODUCTS**

**2.1 MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

**2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS**

- A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.
- B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.
  - 1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at

each floor and at 15 foot maximum intervals (also see Specification Section 22 0050).

- C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.
  - 1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
  - 2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.
- D. Vent Pipe:
  - 1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
  - 2. 2-1/2 inch and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
  - 3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.
- E. Type DWV copper tubing or No-Hub cast iron pipe and fittings may be used for concealed rainwater leaders. Where no-hub piping is used, the fittings and couplings shall match those used for waste piping.
- F. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 0050 for pipe protection requirements for below slab copper piping.
- G. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.
- H. Gas Pipe: Schedule 40 black steel conforming to ASTM A53, with malleable iron threaded fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.
  - 1. Appliance Flexible Connectors for Indoor Equipment Without External Spring Isolation:
    - a. Contractor may choose one of the following:

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- 1) Direct gas pipe connection.
  - 2) Appliance flexible connector:
    - a) Comply with ANSI Z21.24.
    - b) Polymer or hot-dipped PVC coated corrugated 304 stainless steel.
    - c) Operating-Pressure Rating: 0.5 psig.
    - d) End Fittings: Zinc-coated steel.
    - e) Maximum Length: 30 inches.
    - f) Manufacturers: Dormont, Series 30C, 31, 40C, 41, and 51, Brasscraft model ProCoat, or equal.
  - b. Provide with end connections compatible with equipment and piping system.
  - c. Equipment located in spaces normally accessible to building occupants, other than maintenance personnel, shall utilize direct gas pipe connection.
- I. Condensate Drain Piping:
1. Inside buildings provide ASTM B88, Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.
  2. Outside buildings provide ASTM B88, Type L copper pipe and fittings, cast iron drain pipe and fittings or Schedule 40 galvanized steel pipe and cast iron drain or vent fittings.
  3. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
  4. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide threaded metal connector at mechanical equipment, Metraflex Model SST, or equal by Unisource Mfg. Co., or Flexicraft Industries. Arrange flexible connection to ensure drainage of condensate, and support flexible connection at each end of connector, to ensure proper alignment.
  5. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.
  6. Provide cleanout tees or "Y" at each change in direction.

## **2.3 PIPE JOINING MATERIALS**

- A. Refer to piping Articles in this Section for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated

- a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
- b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
- 2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
- 3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
- 4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.
- D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
- E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## **2.4 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS**

- A. General:
  - 1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 6875.
    - a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.
      - 1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 6875.
- B. Gate Valves:
  - 1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
  - 2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
  - 3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
  - 4. Main distribution gate valves underground outside building above 1-1/2 inches:
    - a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
      - 1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
      - 2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.



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#### **C. Ball Valves:**

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

#### **D. Calibrated Balancing Valves:**

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating pressure.
  - a. Body: Brass.
  - b. Ball: 304 Stainless Steel.
  - c. Seat: Glass and Carbon filled TFE.
  - d. End Connections: Threaded.
  - e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
  - f. Handle Style: Dial, with memory stops to retain set position.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. 1 inch and smaller: Bell & Gossett model CB, "LF" series.

## **2.5 VALVES AND FITTINGS FOR GAS SYSTEMS**

#### **A. Gate Valves:**

1. 2-1/2 inches and smaller: Class150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.

#### **B. Gas Shut-off Valve Above Grade:**

1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

## **2.6 DOMESTIC WATER PIPING SPECIALTIES**

#### **A. Hose Bibbs:**

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1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
    - a. Acorn Engineering Co.
    - b. Woodford Manufacturing Co.
  2. Hose Station: Leonard THS-25-VB-CW, Symmons, or equal.
- B. Wall Hydrants:
1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
    - a. Acorn Engineering Co.
    - b. Woodford Manufacturing Co.
    - c. Mifab, Inc.
- C. Water Hammer Arrestors:
1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 6875, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
  2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
  3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.
  4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Josam Company, series 75000.
    - b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
    - c. Mifab, series WHB.
- D. Thermostatic Water Temperature Control Valve:
1. Provide thermostatic water temperature control valve conforming to lead free requirements of California Health and Safety Code Section 11 6875, with size as noted on Drawings, complete with union angle strainer checkstops. Valves shall be thermostatic type, with a maximum temperature setting as follows:
  2. Provide surface semi-recessed mounted, stainless steel cabinet with locking door for control valves. Including:
    - a. Control valve cabinet and valve shall be provided as a package, and include thermostatic water mixing valve, thermometer, safety checkstops, volume control valve and internal piping.

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3. Where indicated on drawings, provide a temperature alarm system, utilizing a micro-processor based controller and solid state temperature controller. Provide audible and visual indication of high and low temperature set points. Provide required hardware and wiring for a complete operating system.
  - a. Provide isolation transformer for control of the alarm system.
  - b. Provide solenoid valve and shock absorber, installed and wired to the alarm module.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Leonard Valve Company.
  - b. Lawler Manufacturing Co., Inc.
  - c. Powers.

#### **E. Relief Valves:**

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Watts Regulator Company.
  - b. Cash (A.W.) Valve Manufacturing Corporation.
  - c. Zurn Industries, Inc.; Wilkins-Regulator Division.

## **2.7 DRAIN AND WASTE PIPING SPECIALTIES**

#### **A. Cleanouts:**

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
  - a. Provide cleanouts in waste drop from each sink and urinal.
  - b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.
2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.

3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.
  - a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
  - b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

**B. Floor Drains:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

**C. Floor Sinks:**

1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

**D. Hopper Drains:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Zurn.
  - b. J.R. Smith.

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.
- B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.
- C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.
- D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

**3.2 INSTALLATION OF WATER PIPING**

- A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.
- B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
  - 1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
  - 2. Install water hammer arresters above accessible ceilings, or install access doors for service.
- C. In freezing locations arrange water piping to drain as shown.
- D. Install piping on room side of building insulation.
- E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

**3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS**

- A. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved.

Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

- B. Storm Drain Piping: Run all horizontal storm drain piping inside of building on a uniform grade of not less than 1/4 inch per foot. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.
- C. Install rainwater leader nozzles at exposed bottom of leaders where they spill onto grade.
- D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.
- E. Grade all vent piping so as to free itself quickly of any water condensation.
- F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.
- G. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.
- H. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

#### **3.4 INSTALLATION OF NATURAL GAS PIPING**

- A. Install natural gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.
- B. Use sealants on metal gas piping threads that are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.
- D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.
- E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.
- F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.
- G. Install drip-legs in gas piping where indicated and where required by code or regulation.
  - 1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.
  - 2. Where gas supply is connected to equipment with flexible connectors, install drip-leg in piping on downstream side of flexible connector, and install shut off valve on piping on upstream side of flexible connector.
- H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.

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- I. Install piping parallel to other piping.
- J. Paint all gas piping installed in exposed exterior locations. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods, article, Painting.
- K. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: "Gas Shut-Off." Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.
- L. Provide watertight Schedule 40 PVC conduit to protect gas piping installed below covered walk, covered driveways, and where noted on Drawings. Extend sleeve at least 12 inches beyond any area where it is required to be installed, and terminate with valve box extended to grade, and marked "GAS".

### **3.5 PIPE JOINTS AND CONNECTIONS**

- A. General:
  - 1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
  - 3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
- B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- D. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
  - 1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.
- E. Cast Iron Soil Pipe:
  - 1. No-Hub fittings shall be made with a torque wrench.
  - 2. Hub joints shall be with Ty-Seal couplings.

3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

F. Welded Pipe:

1. Make up with oxyacetylene or electric arc process.
2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

### **3.6 INSTALLATION OF VALVES**

A. Install valves as indicated on Drawings and in the following locations:

1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph "Butterfly Valves" may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph "Ball Valves" may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:



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- a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
  - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- D. Silent Check Valves: Install in horizontal or vertical position between flanges.
- E. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers' recommendations, including requirements for straight pipe lengths at valve inlet and outlet.
- F. Gas Shut-Off Valves:
  - 1. Provide line size ball valve in gas line to each appliance.
- G. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### **3.7 INSTALLATION OF CLEANOUTS**

- A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

### **3.8 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS**

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

### **3.9 EQUIPMENT CONNECTIONS**

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

### **3.10 DOMESTIC WATER SYSTEM STERILIZATION**

- A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.

1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

**3.11 CARE AND CLEANING**

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

**3.12 OPERATIONAL TESTS**

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

**3.13 TESTING AND BALANCING**

- A. See Section 23 0593 of Specifications for testing and balancing requirements.

**3.14 CLEANING UP**

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Water supplies and stops.
  - 2. Plumbing fixture hangers and supports.

**1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 0050 Basic Plumbing Materials and Methods.

**1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Refer to Section 22 0050, Basic Plumbing Materials and Methods.

**1.5 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

**1.6 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:
  - 1. California Building Code – CBC
  - 2. California Plumbing Code – CPC
  - 3. California Health and Safety Code
  - 4. American National Standards Institute - ANSI
  - 5. Federal Standards - F.S.

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- 6. National Sanitary Foundation – NSF International
- C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”
- D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.
- E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.
- F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.
- G. Americans with Disabilities Act (ADA).
- H. California Green Building Standards Code Requirements:
  - 1. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

**PART 2 - PRODUCTS**

**2.1 PLUMBING FIXTURES**

- A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.
  - 1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
  - 2. Take location and mounting heights for roughing-in from Architectural Drawings.
  - 3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
  - 4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

**2.2 MATERIALS**

- A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
- B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

- C. Handles on all faucets and stops shall be all metal chromium plated.
- D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

### **2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES**

- A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
  - 1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.
- B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.
- C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.
- D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.
- F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.
- G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

### **2.4 MANUFACTURERS**

- A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.
- B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:
  - 1. Vitrified China Plumbing Fixtures:
    - a. American Standard, U.S. Plumbing Products.
    - b. Eljer Plumbingware Div., Wallace-Murray Corp.
    - c. Kohler Co.
    - d. VitrA.

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**2.5 FIXTURE CONNECTIONS**

- A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.
- B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Dearborn Brass, Commercial series with brass nuts.
    - b. Delta Commercial.
    - c. McGuire Manufacturing Co., Inc.
- C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.
- D. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

**2.6 WATER SUPPLIES AND STOPS**

- A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 6875, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.
- B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.
- C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.
- D. Provide cast brass escutcheon.
- E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. McGuire Manufacturing Company, Inc., model LFH2167LK.
  - 2. T & S Brass and Bronze Works, Inc., model B-1305.

## **2.7 PLUMBING FIXTURES**

- A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.
- B. Special Requirements For Accessible Fixtures:
  - 1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
  - 2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded "closed-cell" vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

## **PART 3 - EXECUTION**

### **3.1 PRODUCT HANDLING AND PROTECTION**

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

### **3.2 PREPARATORY PROVISIONS**

- A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

### **3.3 INSPECTION AND PREPARATION**

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

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- D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.
- E. Refer to Division 26 for wiring for electronic flush valves.

#### **3.4 FAUCET INSTALLATION**

- A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 11 6875, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.
- B. Adjust metering faucets to run for 10 to 15 seconds.

#### **3.5 CLEAN AND PROTECT**

- A. Clean plumbing fixtures of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.
- C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

#### **3.6 FIELD QUALITY CONTROL**

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

#### **3.7 EXTRA STOCK**

- A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Electric motors.
  - 2. Motor starters.
  - 3. Access Doors.
  - 4. Expansion loops.
  - 5. Flexible joints.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 23 Section.
- C. Refer to Section 23 0800.13, T-24 Commissioning of HVAC for Title 24 commissioning requirements.

### **1.3 ADDITIONAL REQUIREMENTS**

- A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.
- C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

### **1.4 REFERENCES AND STANDARDS**

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. AABC - Associated Air Balance Council
  - 2. AFBMA - Anti Friction Bearing Manufacturer's Association
  - 3. AMCA - Air Moving and Control Association Inc.
    - a. Standard 210 - Laboratory Methods of Testing Fans
  - 4. ANSI - American National Standards Institute
  - 5. ARI - Air-Conditioning and Refrigeration Institute

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6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME - American Society of Mechanical Engineers
8. ASTM - American Society for Testing and Materials
9. CCR - California Code of Regulations
  - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
10. CSA – Canadian Standards Association International
11. CSFM - California State Fire Marshal
12. NCPWB - National Certified Pipe Welding Bureau
13. NIST - National Institute of Standards and Technology
14. NEMA - National Electrical Manufacturers' Association
15. NFPA - National Fire Protection Association
16. OSHA - Occupational Safety and Health Act
17. SMACNA - Duct Manuals
18. UL - Underwriters' Laboratories, Inc.

**B. Requirements of Regulatory Agencies:**

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
  - a. California Building Code, 2022.
  - b. California Electrical Code, 2022.
  - c. California Energy Code, 2022.
  - d. California Fire Code, 2022.
  - e. California Green Building Standards Code, 2022.
  - f. California Mechanical Code, 2022.
  - g. California Plumbing Code, 2022.
  - h. California Code of Regulations, Title 24.
  - i. California Health and Safety Code.
  - j. CAL-OSHA.
  - k. California State Fire Marshal, Title 19 CCR.
  - l. National Fire Protection Association.
  - m. Occupational Safety and Health Administration.
  - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

**1.5 DRAWINGS**

- A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
  2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
  3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

## **1.6 FEES AND PERMITS**

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
- C. Coordination:
1. General:
    - a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
  3. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

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- 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
  - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
  - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
4. Mechanical Coordination:
- a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
  - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
  - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
  - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

**1.7 SUBMITTALS - GENERAL**

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.

6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
  - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
  - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
  - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.
  1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

## **1.8 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

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1. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
3. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
  - a. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
  - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2019 California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

**1.9 INFORMATIONAL SUBMITTALS**

- A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 8000.
- B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.
- C. Check, Test, and Start forms, from equipment manufacturers.
- D. Check, Test and Start reports.

**1.10 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:

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1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
    - 6) Copies of guarantees/warranties for each item of equipment or systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Temperature control diagrams and literature.
    - 11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
    - 12) Commissioning and Preliminary Operation Tests required as part of the Work.
2. Post service telephone numbers and addresses in an appropriate place designated by Architect.

**B. Record Drawings:**

1. Refer to Division 01 for additional requirements.
2. Upon completion of the Work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.
  - b. One complete set of reproducible drawings showing the Work exactly as installed.
  - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
  - d. Provide Contractor's signature, verifying accuracy of record drawings.
  - e. Obtain the signature of the Inspector of Record for Record Drawings.

**1.11 SUBSTITUTIONS**

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

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- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  - 1. Reason for substitution request.
  - 2. Complete submittal information as described herein; see "Submittals."
  - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  - 5. Explanation of impact on connected utilities.
  - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.
- G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

**1.12 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.
- C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.
- D. All materials and products shall be new.

**1.13 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.



**1.14 FIELD CONDITIONS**

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

**1.15 WARRANTY**

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum,.
- C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

**2.2 MATERIALS**

- A. No material installed as part of this Work shall contain asbestos.
- B. California Green Building Code Compliance:
  - 1. HVAC and refrigeration equipment shall not contain CFCs.
  - 2. HVAC and refrigeration equipment shall not contain Halons.

**2.3 ELECTRIC MOTORS**

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. U.S. Motors.
  - b. Century Electric.
  - c. General Electric.
  - d. Lincoln.
  - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
  1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
  1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
  2. Motors Used with Variable Frequency Controllers:
    - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
    - c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
    - f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split phase.
  - c. Capacitor start, inductor run.
  - d. Capacitor start, capacitor run.
3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:
  - a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.
    - 1) Exceptions:
      - a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
      - b) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.
4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
7. Motors 1/20 HP and Smaller: Shaded-pole type.
8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

## **2.4 MOTOR STARTERS**

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
  1. All starters shall have the following:
    - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.

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- b. Ambient compensated thermal overload.
  - c. Fused control transformer (for 120 or 24 volt service).
  - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

**2.5 ACCESS DOORS**

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.
- E. Provide insulated doors where located in internally insulated ducts or casings.
- F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## **2.6 THERMAL AND SEISMIC EXPANSION LOOPS**

- A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend. Return bend section shall have support lug and plugged FPT drain. Flexible hose shall consist of corrugated metal inner hose and braided metal outer sheath. Assemblies shall be constructed from materials compatible with the fluid or gas being conveyed and shall be suitable for the system operating pressure and temperature. Provide assembly selected for 4 inches of movement.
- B. Assembly shall be suitable for use with R-410A refrigerant. Provide assembly without drain, cleaned, capped, and labeled for specific use.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Metraflex Inc., Metraloop series, or comparable product by one of the following, or equal:
  - 1. Flexicraft Industries.

## **2.7 FLEXIBLE JOINTS**

- A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.
- B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

## **2.8 PIPE GUIDES**

- A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

## **2.9 EQUIPMENT IDENTIFICATION**

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## **2.10 PIPE IDENTIFICATION**

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legend and flow arrow shall conform to ASME A13.1.

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**PART 3 - EXECUTION**

**3.1 EXISTING MATERIALS:**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

**3.2 FRAMING, CUTTING, AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

**3.3 MECHANICAL DEMOLITION**

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.

3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
  4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### **3.4 ELECTRICAL REQUIREMENTS**

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### **3.5 PIPING SYSTEM REQUIREMENTS**

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

### **3.6 PRIMING AND PAINTING**

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. Priming and painting:
  1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

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- a. Black Steel Piping:
  - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

**3.7 EXCAVATING**

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.
- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.



### **3.8 BACKFILLING**

- A. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- B. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- C. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

### **3.9 PIPING AND DUCT SYSTEMS INSTALLATION**

- A. General:
  - 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
  - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
  - 3. Install piping to permit application of insulation and to allow valve servicing.
  - 4. Where piping, conduit, or ductwork is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
  - 5. Horizontal runs of pipes, conduits, or ductwork suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
  - 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
  - 7. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component opening shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency.
  - 8. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
  - 9. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
  - 10. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
  - 11. Install horizontal valves with valve stem above horizontal.

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12. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
13. Verify final equipment locations for roughing-in.
14. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
15. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

**B. Expansion Loops:**

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.
4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

**C. Sleeves:**

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

**D. Floor, Wall, and Ceiling Plates:**

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

**E. Firestopping:**

1. Pack the annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or

floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with CBC requirements.

3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Firestopping systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

**F. Flashing:**

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues, ducts, and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Elmdor/Stoneman Model 1540.
  - c. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4.

**G. Hangers and Supports:**

1. General: Support ductwork, equipment and piping so that it is firmly held in place by approved iron hangers and supports, and special hangers. Hanger and support components shall support weight of ductwork, equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping or ductwork with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping and ductwork support spacing, provide

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“bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

- a. Materials, design, and type numbers for support of piping per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
  - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
- b. Materials and design for ductwork support shall be per SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Copper Brazed or Soldered (Notes 3, 4)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

- 1) Note 1: Provide mid-story guides.
- 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 4) Note 4: Includes refrigerant piping, including vapor and hot gas pipes.
- b. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

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<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Copper Brazed or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.

5. Suspended Piping:

- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturers' published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.

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- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Above Roof: H frame made from Uni-Strut hot-dipped galvanized 1-5/8 inch single or double channel with P-2072A or P-2073A foot secured to roof and surrounded with waterproof roofed-in sleeper. Secure to sleeper with lag screws, and secure sleeper to blocking under roof.
- h. Steel Connectors: Beam clamps with retainers.
- 6. Duct Hanger and Support Spacing: Conform to Requirements of CMC and SMACNA "HVAC Duct Construction Standards, Metal and Flexible."
- 7. Support to Structure:
  - a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
    - 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062      MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
- b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.
- 8. Rubber Neoprene Pipe Isolators:
  - a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

9. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
10. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
11. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
12. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
13. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.
14. On chilled or combination hot and chilled water or refrigerant pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

### **3.10 UNION AND FLANGE INSTALLATION**

- A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.
- B. Install unions in piping NPS 2" and smaller 3 or flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.
- C. Locate the unions for easy removal of the equipment, tank, or valve.
- D. Do not install unions or flanges in refrigerant piping systems.

### **3.11 ACCESS DOOR INSTALLATION**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### **3.12 PIPE PROTECTION**

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

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2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. holiday detector, or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

**3.13 PIPE IDENTIFICATION**

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
  1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.
- E. Apply the markings after painting and cleaning of piping and insulation is completed.



### **3.14 TRACER WIRE INSTALLATION**

- A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.
- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

### **3.15 OPERATION OF SYSTEMS**

- A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
  - 1. Complete all requirements listed under "Check, Test and Start Requirements."
  - 2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  - 3. Filters, strainers etc. are in place.
  - 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  - 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.
- C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

### **3.16 CHECK, TEST AND START REQUIREMENTS**

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
  - 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  - 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.

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3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

**3.17 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS**

- A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
  2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Damaged fins on heat exchangers have been combed out.
  7. Missing or damaged parts have been replaced.
  8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  11. Preliminary test and balance work is complete, and reports have been forwarded for review.
  12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
  13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

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1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
  3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Before handing over the system to Owner replace all filters with complete new set of filters.
- D. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- E. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- F. Preliminary Operation:
1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.
- G. Operational Tests:
1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
  2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
  3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
  4. Control systems shall be completely operable with settings properly calibrated and adjusted.

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5. Rotating equipment shall be in dynamic balance and alignment.
6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

**H. Pre-Occupancy Building Purge:**

1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.
2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

**3.18 DEMONSTRATION AND TRAINING**

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
  2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
    - a. Listing of Owner-designated personnel completing training, by name and title.
    - b. Name and title of training instructor.
    - c. Date(s) of training.
    - d. List of topics covered in training sessions.
  4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 PROJECT STANDARDS**

- A. Become familiar with the general layout of the facility. Provide the Engineer with a written report including hours worked, work accomplished, and work to be completed on the next shift. All reports shall be submitted at shift end to the Engineer.

**1.2 PRE-PROJECT REPORT**

- A. Submit a pre-project document including findings and recommendations for cleaning of all air delivery system services. Provide photographic evidence of conditions found in duct work, components, and air handlers including lab reports. See Article 3.02 of this Section for establishment of existing contamination levels.

**1.3 QUALITY ASSURANCE**

- A. Inspection, contamination evaluation, hygienic maintenance service, and monitoring probe installation shall be performed by a supervisor with a minimum of two (2) years experience in projects of equal or greater scope.
- B. Do not cause or allow any of the work to be covered up or enclosed until it has been inspected and approved by the engineer. Should any of the work be covered up or enclosed before such inspection, the contractor shall at his own expense, uncover the work, and after it has been inspected and approved, make all repairs with such materials as may be necessary to restore all his work to its original and proper conditions.

**1.4 SAFETY**

- A. Contractor shall provide the Engineer with a copy of the safety manual or document utilized by the crew leader. Safety meetings shall be conducted on a daily basis before shift starts.

**1.5 LAB REQUIREMENTS**

- A. The laboratory used shall be registered by the State of California. Contractor shall provide the Engineer with the laboratory analysis and reporting techniques to be used. All work provided by the laboratory to the Contractor shall be submitted in the project report as received from the lab.

**1.6 CONSTRUCTION SCHEDULE**

- A. All work shall be performed during non-business hours of the facility. All HVAC systems shall be returned to normal operating conditions at the end of each shift. All work areas shall be cleaned up after each shift so to have no impact on normal operations of the facility or personnel. Refer to Division 1 of the specifications for approved work schedules.

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**PART 2 - EQUIPMENT**

**2.1 CLEANING EQUIPMENT**

- A. Provide equipment and materials for cleaning, repairing and inspection work including scaffolding, wire brushes, rotary brushes, filters, air lances, mechanical agitators, fiber optic borescopes, vacuums, or other equipment and materials necessary for workmen to perform work specified. Any chemical utilized in this project shall have a Material Safety Data Sheet (MSDS) submitted to the State before product usage.
- B. Should the cleaning methodology require power vacuuming, the Contractor shall provide HEPA filtered power vacuum(s) operating at a minimum of 16,000 C.F.M. at 21" P.S.I., 25 C.F.M. air compressor operating at 210# P.S.I.; electric power vent cleaner and reverse jet air flow nozzle, or similar equipment required to properly carry out the work. Suitable protective covering shall be provided by the Contractor in all areas of work operation. Any mechanical defects to be reported to the Engineer and logged.

**2.2 ACCESS DOORS**

- A. Galvanized steel access doors and frames in duct work and plenums shall be, as a minimum, of same thickness sheet metal as duct or plenum in which installed and shall be of the double paneled or hollow type. Doors in insulated ducts shall be set flush with the exterior insulation surface and shall be of the double panel insulated type with a minimum of one inch (1") thick insulation.
- B. Doors 72 inches and over in height shall have four hinges; doors 24" to 71" shall have three hinges and doors under 24" shall have two hinges. Access doors over 22" in height shall be equipped with two latches; doors 14" to 21" with one latch. Access doors which are 14" x 14" and smaller shall be removable (without hinges and shall have a minimum of two sash latch fasteners).
- C. Access doors to outside air, return air, mixed air and coil plenums for air handlers shall have operable handles both sides of door.
- D. All doors shall seal against neoprene gaskets. Door installations shall be made air tight on all supply, return and exhaust ducts, plenums and equipment with a four ounce, four inch (4") wide tape saturated with solvent lagging adhesive and firmly applied. Solvent shall be non-flammable. The stripping shall be applied prior to insulation repairs. All materials shall be 25/50 flame/smoke spread rated.
- E. Ceiling access shall be Karp Associates type Katr or equal. Ceiling access door shall be designed to provide access in the existing suspended ceiling that is part of the fire rated floor - ceiling assembly the combination of steel, wall board and ceiling tile shall maintain the fire resistive qualities of the existing ceiling.
- F. Ceiling access shall be 30 inches by 22 inches maximum. Duct access doors shall be a minimum of 14 x 12 inches unless further limited by duct size.
- G. The ceiling access doors shall be installed according to the manufacturer's recommendations.

- H. Ceiling access door frame shall be 16 gage steel and door shall be 18 gage steel.
- I. Door shall be recessed 1-1/2 inches to accommodate double thickness of wall board and matching ceiling tile.
- J. Door hinge shall be continuous piano hinge.
- K. Locks shall be screwdriver operated with 1 inch stainless steel cam and lock studs (or shall be key operated cylinder lock with automatic dust shutter) furnished with plastic grommet to protect hole made in wall board and tile.
- L. Finish shall be prime coat of rust inhibitive electrostatic powder, baked grey or white enamel.
- M. Refer to contract drawings for framing details.

### **2.3 SANITIZING FLUID**

- A. Microban X580, Dichlorothen, Certi-Phene, or equal. Sanitizing fluid shall be applied to all scope-related surfaces after cleaning.

## **PART 3 - HYGIENIC MAINTENANCE PROCESS**

### **3.1 TEMPORARY FILTER MEDIA (IF REQUIRED)**

- A. Prior to any cleaning, temporary filter media is to be fitted to those diffusers/grilles or they may be sealed with a minimum of 6 mil polyethylene sheeting. All openings shall be suitably protected to avoid contamination and debris from entering the conditioned air spaces.

### **3.2 ESTABLISHMENT OF EXISTING CONTAMINATION LEVELS**

- A. As directed by the Engineer to evaluate existing contamination levels, Contractor shall take samples of contaminants within the duct work and in other strategic locations to track contaminants throughout the air delivery system. Particulate samples shall be gathered with sterile swabs and then analyzed for general identification. Microbial samples shall be collected by utilizing HYCON Contact Slides. Culturing methodology shall conform to manufacturer's specifications and requirements. Molds and Bacteria are the general microbial constituents to be sampled for at designated areas. Samples shall be clearly identified in the Pre and Post-Project Reports as to sampling locations. In addition, photographs shall be taken of these sample locations for documentation in the Pre and Post-Project Reports.
- B. Sample Locations
  - 1. 4 Supply duct
  - 2. 1 Mixing box (if any exist)
  - 3. 1 Return air duct
  - 4. 1 Air handling unit (coil area)
  - 5. 4 Ceiling return air plenum

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- C. Locations are to be sampled for ea/ Air Handling Unit System & related ductwork, as a minimum.
- D. Particulate Samples (Wipes): Shall be analyzed using microscopic techniques to identify general content; i.e. rust, fibrous, carbon, crystalline, etc. These will assist in tracking movement of material within the system and the areas of breakdown.
- E. Microbial Samples: Use Hycon agar contact surface slides to identify general levels of mold and bacteria present. Results shall be expressed in total CFU's (Colony Forming Units).
- F. Verification of Systems Cleaning: Shall be established initially by NADCA (National Air Duct Cleaning Association) Standards.

**3.3 DUCTWORK CLEANING PROCESS**

- A. Cleaning Methodology Option #1:
  - 1. Contractor shall install access ports into all supply and return ductwork at 15 feet maximum intervals. Access ports shall be a permanent reusable system 50 mm round or provide access doors that conform to Article 2.02 of this Section. All related duct work must not be cut into for cleaning purposes other than to install access points. The structural integrity of the duct work shall not be altered by access system installation. The duct access ports shall be installed with sheet metal screws onto the outside of the duct.
    - a. When access points are installed in concealed attic areas, visual checks are to be made of the condition of both the external duct insulation and the ducts themselves at "T" joints, etc. Where breaks in either insulation or duct work are found, these are to be documented and submitted as found.
    - b. After the work is done, the duct penetration (through the access port) shall be closed airtight with a threaded plug screwed into the access port.
  - 2. Prior to the start of the cleaning process the fan powered HEPA filtered collection devices shall be securely connected to the supply outlets to be treated. Sufficient negative pressure shall be generated within the designated duct runs to ensure all particulate contamination is removed and contained under controlled conditions.
  - 3. By inserting special air lances, mechanical agitators or rotary brushes through the installed access points, gently remove all loose contaminants from the interior surfaces of the duct work. Where duct work has internal insulation or other fragile components, take precautions not to disrupt or damage these sensitive areas. Under no circumstances shall any workers be allowed to climb inside of the duct work onto any fragile internal surfaces or components.
  - 4. Fan powered, high efficiency dust and particulate collection systems shall be utilized in areas where contaminants are being removed from the system. Contractor shall take all necessary precautions to prevent dirt and debris from entering the conditioned areas. The collection systems shall be a self-contained unit, with appropriate components to adequately prevent dirt and debris loosened from upstream duct mains and branches during cleaning operations from entering the conditioned spaces by capturing this debris within the collection device. The filter(s) utilized in the collection systems shall be an industrial grade



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type, labeled and certified HEPA filter to be no less than 99.97 percent efficient on particles of 0.3 microns and greater at rated flow.

B. Cleaning Methodology Option #2:

1. All ducts shall be thoroughly cleaned by power vacuuming. Ductwork that does not allow complete access shall be entered by means of access doors as described in Article 2.02 of this Section.

C. All ducts shall be inspected as work proceeds. Any defects in the duct system found during the cleaning process shall be immediately brought to the attention of the Engineer. All minor repairs such as caulking, sealing, and reconnecting shall be performed as part of the contracted scope of work.

1. Caulking or sealing compound:
  - a. 3-M No. 900 duct sealer, Tuff Bond No. 29, Permacel No. EZ-4719, Foster 32-14, United Duct Sealer, or equal.

D. Doors shall be installed at selected locations so as to accommodate the complete cleaning of the ductwork systems but not exceeding 10 foot intervals.

E. Internal Lining or Fiberglas Manufactured Ducts:

1. Where supply ducts have either internal lining (fiberglass) insulation or are fiberglass manufactured ducts, the internal surfaces shall be coated, to control surface breakdown. Apply second coating, if required, to ensure complete encapsulation. Coating shall meet 25/50 flame and smoke spread as tested in accordance with ASTM E84.

F. Grilles, Registers, and Diffusers:

1. Whenever the grilles, registers and diffusers are removable, they shall be removed, vacuum cleaned, washed, dried and then reinstalled. Non-removable grilles, registers, and diffusers shall be cleaned in place.

G. Duct Coils:

1. Clean duct coils by air washing and brushing to ensure all contaminants are removed from between the fins. If fins are bent prior to cleaning, utilize a coil combing system to straighten fins as best as possible.

### **3.4 DUCT COIL CLEANING PROCESS**

- A. Duct mounted coils shall be hand washed (air or water) on both coil faces carefully to avoid damage to tubes and fins. Thoroughly clean coil faces ensuring contaminants are removed. Remove corrosion from around coil frames; hand brush and vacuum clean. Paint all corroded metal frame surfaces. Where necessary, recomb coil fins to restore them to original condition. Before cleaning process begins on both sides of the coil perform before and after pressure readings.

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**3.5 DAMPER, MOTOR, TURNING VANES AND LINKAGE CLEANING AND REPAIR  
PROCESS**

- A. Control dampers for air handling systems, duct-mounted volume, fire and zone dampers, and turning vanes shall be inspected, cleaned and repaired. Mark dampers to their current setting. Contractor shall assume one volume damper per branch and that 50% are not functioning and will require major repairs or replacement.
- B. Repairs shall include straightening and aligning of vanes, blades and linkages.
- C. All related equipment shall be power vacuumed and high pressure washed where required.
- D. Areas with rust or scale build-up shall be wire brushed or scraped.
- E. All damper motors and linkages shall be lubricated and set into their original position upon completion of work. Lubricant material - Aerolex Dry Moly, or equal.

**3.6 MIXING BOX CLEANING AND REPAIR**

- A. Mixing boxes shall be cleaned. Work on each unit includes the following:
  - 1. Remove access panel from the base of mixing box, taking precautions not to disturb wires, cables, or setting of appurtenances of each mixing box or appurtenances adjacent to box.
  - 2. Remove loose contamination from the internal areas of the box.
  - 3. Repair patch all damaged insulation where necessary with Linacoustic fiber glass duct liner or equivalent. All insulation shall have as a minimum 1 inch thickness.
  - 4. After the removal of all loosened contaminants is completed and damaged insulation is repaired, the coating shall be carried out. Coat all insulated surfaces of the box interiors with a insulation sealant; Fosters 30-36, or equal. Apply second coating, if required, to ensure complete encapsulation.
  - 5. Actuators, linkages and dampers on all boxes shall be inspected and repaired. It is estimated 75% or more of the boxes need repair.

**3.7 EQUIPMENT ROOMS AND AIR PLENUM CLEANING PROCESS**

- A. Related air plenums and/or equipment room locations that are within the airstream of this project shall be thoroughly cleaned and sanitized utilizing lead dust cleanup procedures. Such work except ceiling return air plenums shall include the following:
- B. Remove all water from floor area, note leaks; report on pipe work conditions. Vacuum clean all surfaces, including walls, floors, and ceiling surfaces. All other debris shall be removed from the area by the Contractor. Plenum areas shall be visually inspected and sealed air-tight with an approved caulking compound.
- C. All supply duct lining shall be coated as in paragraph 3.03F.
- D. Remove all corrosion from all metal areas by scraping, sanding, or wire brushing.

- E. Contractor has the responsibility to ensure that all areas are left in a correct operating mode; all switches, lights, doors, hatches, and controls are returned to their original setting.
- F. Contractor shall, at the end of each shift, remove all waste dirt and debris resulting from the work performed.

### **3.8 IR HANDLING UNIT CLEANING PROCESS**

- A. The air handling units shall be cleaned. Prior to work commencement, a pre-arranged schedule shall be established with the State Construction Supervisor. Work on each unit includes the following:
  - 1. Fresh air plenums shall be cleaned thoroughly. Inlet louvers, mixing dampers, and turning vanes, if corroded, shall be scraped, primed, and top coated as necessary. All debris shall be removed from plenum areas and concrete floors thoroughly cleaned to remove surface debris.
  - 2. Remove air filters. If metal is corroded, hand scrape, prime, and top coat the filter holding frames.
  - 3. Hand wire brush all areas of side, roof, and ceiling panels as necessary.
  - 4. Remove all corrosion from around coil frames and drain pans; hand brush and vacuum clean.
  - 5. Paint affected areas of coil frames, using a zinc rich primer and enamel top coat paint.
  - 6. Heating and Cooling Coils:
    - a. Prior to cleaning of coils, take a pressure reading on both sides of the coil while system is in operation. Take identical readings after the coil is cleaned; note pressure change and submit findings.
    - b. Cleaning will consist of washing downstream of coil first and then upstream utilizing a high pressure water cleaning system with a suitable biodegradable cleaning agent, thoroughly cleaning coil faces ensure all contaminants and materials are removed. Take precautions not to damage coil fins. If fins are bent prior to cleaning, straighten (as best as possible) fins utilizing a coil combing system. High power wash will be performed with a water spray device that delivers a minimum of 500 PSI. Detergent cleaning shall be followed by thorough rinsing with fresh water. Any degreasing of the coils shall be performed before final cleaning to ensure complete removal of any residual build-up.
    - c. Drain pans are to be cleaned and cleared before any pressure washing be performed, thus assuring complete and safe drainage.
  - 7. Vacuum clean and hand wash fan casing, motors and fan wheels so that all grease and debris is removed. A degreasing solution shall be used in areas where required.
  - 8. Hand scrape fan impellers and remove all loose contaminants from within the fan casing.
  - 9. Where insulation is damaged or fragile, repair patch as necessary. If the insulation facing is damaged non-existent, the facing shall be coated.
  - 10. Report all locations where access doors are missing and filter housings damaged or destroyed to the engineer.

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**PART 4 - POST PROJECT REQUIREMENTS**

**4.1 MONITORING PROGRAM AND WARRANTY**

- A. Provide one (2) year warranty of all work, dated from the project completion date. Provide quarterly visual inspections during the warranty period in 4 different areas of the building. Set up monitoring probes as required.

**4.2 POST PROJECT REPORT**

- A. Submit a post-project report within 45 calendar days of the completion of the project. The report shall summarize the project, contrast contamination levels of the sampling locations in the pre-project report, and provide photographic evidence documenting the results of the project (see Article 3.02 B of this Section).
- B. Record mechanical defects, insulation encapsulation, pressure readings from coils, and all air delivery system improvements. Provide photographic documentation of all information.
- C. Provide a record drawing showing the exact installed positions of all access doors and access ports.

**PART 5 - MISCELLANEOUS**

**5.1 CLEAN UP PROCEDURES**

- A. Upon completion of work, and at the end of each shift, clean up the assigned work area of all trash, rubble, rags, containers, materials, and equipment resulting from work on this contract, and remove same from the premises at no additional cost.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
  - 2. Balancing Domestic Water Piping Systems.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.3 REFERENCES AND STANDARDS**

- A. Associated Air Balance Council (AABC)
  - 1. National Standards for Total System Balance, latest edition.
- B. National Environmental Balancing Bureau (NEBB)
  - 1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

### **1.4 DEFINITIONS**

- A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications

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and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

- B. Similar Terms: The following table is provided for clarification only:

<u>Similar Terms</u>		
<u>Contract Term</u>	<u>AABC Term</u>	<u>NEBB Term</u>
TAB Specialist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

- C. AABC: Associated Air Balance Council.
- D. NEBB: National Environmental Balancing Bureau.
- E. TAB: Testing, adjusting, and balancing.
- F. TAB Organization: Body governing practices of TAB Specialists.
- G. TAB Specialist: An entity engaged to perform TAB Work.

**1.5 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.

**1.6 INFORMATIONAL SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
1. Provide list of similar projects completed by proposed TAB field supervisor.
  2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.

- C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
  - 1. Submit examinations report with qualifications data.
- D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.
- F. Certified TAB reports.
  - 1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.
    - a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

#### **1.7 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

#### **1.8 QUALITY ASSURANCE**

- A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC NEBB.
  - 1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.

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- B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:
  - 1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC NEBB.
    - a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.
  - 2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC NEBB as a TAB technician.
    - a. TAB technician shall have minimum 4 years TAB field experience.
- C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.
- D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.
- E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.
  - 1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.
- F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.
- G. TAB Standard:
  - 1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:
    - a. AABC National Standards for Total System Balance
    - b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
  - 2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
  - 3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.
- H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project



requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:
    - a. The Contract Documents examination report.
    - b. The TAB plan.
    - c. Coordination and cooperation of trades and subcontractors.
    - d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.
  2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.
- I. Certify TAB field data reports and perform the following:
1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect.
- K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

## **1.9 WARRANTY**

- A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:
1. AABC Performance Guarantee.
  2. NEBB Quality Assurance Program.
- B. Refer to Division 01 Specifications for additional requirements.

## **1.10 COORDINATION**

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- C. Coordinate TAB work with work of other trades.

## **PART 2 - PRODUCTS (Not Applicable)**

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Contract Documents Examination Report:
  - 1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:
    - a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
    - b. Proposed corrective action necessary for proper system operation.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine system pumps to ensure absence of entrained air in the suction piping.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Report conditions requiring correction discovered before and during performance of TAB procedures.

- N. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### **3.2 PREPARATION**

- A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:
  - 1. General description of each air system and sequence(s) of operation.
  - 2. Complete list of measurements to be performed.
  - 3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
  - 4. Qualifications of personnel assigned to Project.
  - 5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc).
  - 6. Air terminal correction factors for the following:
    - a. Air terminal configuration.
    - b. Flow direction (supply or return/exhaust).
    - c. Effective area of each size and type of air terminal.
    - d. Air density.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.
  - 2. Automatic temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance, smoke, and fire dampers are open.
  - 5. Isolating and balancing valves are open and control valves are operational.
  - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

### **3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 0713

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"Duct Insulation," Section 23 0716 "HVAC Equipment Insulation," Section 23 8000 Heating, Ventilating, and Air Conditioning."

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

**3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS**

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.
- C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.
  - 1. Use state-of-the-art instrumentation approved by TAB specialists governing agency.
  - 2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.
- D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.
- E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- H. Verify that motor starters are equipped with properly sized thermal protection.
- I. Check dampers for proper position to achieve desired airflow path.
- J. Check for airflow blockages.
- K. Check condensate drains for proper connections and functioning.
- L. Check for proper sealing of air-handling-unit components.
- M. Verify that air duct system is sealed as specified in Section 23 8000 "Heating, Ventilating, and Air Conditioning."

- N. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.
- O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

### **3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS**

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
  - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  - 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

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- B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.
- C. Check operation of outside air dampers. Measure total outside air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust outside air dampers to provide 100 percent outside air in economizer mode. Ensure that outside air dampers close completely upon unit shutdown.
- D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
  - 1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
  - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- E. Measure air outlets and inlets without making adjustments.
  - 1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.
- F. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
  - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.
  - 2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.
- G. Do not overpressurize ducts.

**3.6 PROCEDURES FOR HEAT EXCHANGERS**

- A. Measure water flow through all circuits.
- B. Adjust water flow to within specified tolerances.

- C. Measure inlet and outlet water temperatures.
- D. Measure inlet steam pressure.
- E. Check settings and operation of safety and relief valves. Record settings.

### **3.7 PROCEDURES FOR MOTORS**

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  - 1. Manufacturer's name, model number, and serial number.
  - 2. Motor horsepower rating.
  - 3. Motor rpm.
  - 4. Efficiency rating.
  - 5. Nameplate and measured voltage, each phase.
  - 6. Nameplate and measured amperage, each phase.
  - 7. Starter manufacturer's name, model number, size, type, and thermal-protection-element rating.
    - a. Starter strip heater size, type, and rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

### **3.8 PROCEDURES FOR CONDENSING UNITS**

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

### **3.9 PROCEDURES FOR HEAT-TRANSFER COILS**

- A. Measure, adjust, and record the following data for each electric heating coil:
  - 1. Nameplate data.
  - 2. Airflow.
  - 3. Entering- and leaving-air temperature at full load.
  - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
  - 5. Calculated kilowatt at full load.
  - 6. Fuse or circuit-breaker rating for overload protection.
- B. Measure, adjust, and record the following data for each refrigerant coil:
  - 1. Dry-bulb temperature of entering and leaving air.

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2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.

**3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS**

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  1. Measure and record the operating speed, airflow, and static pressure of each fan.
  2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  3. Check the condition of filters.
  4. Check the condition of coils.
  5. Check the operation of the drain pan and condensate-drain trap.
  6. Check bearings and other lubricated parts for proper lubrication.
  7. Report on the operating condition of the equipment and the results of the measurements taken. Report conditions requiring correction.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
  1. New filters are installed.
  2. Coils are clean and fins combed.
  3. Drain pans are clean.
  4. Fans are clean.
  5. Bearings and other parts are properly lubricated.
  6. Conditions requiring correction noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
  1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.



### **3.11 TOLERANCES**

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances: Plus 10 percent and minus 0 percent.
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent.
  - 2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent.
  - 3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for "Air Outlets and Inlets".
    - a. Room shall be balanced to create pressure relationship (positive, negative, or neutral) with adjacent spaces as indicated on Drawings. Maintain airflow differentials between supply, return, and exhaust indicated on Drawings.
- B. Set plumbing systems water flow rates within plus or minus 10 percent.

### **3.12 REPORTING**

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### **3.13 FINAL REPORT**

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
  - 2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
  - 3. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Pump curves.
  - 2. Fan curves.
  - 3. Manufacturers' test data.
  - 4. Field test reports prepared by system and equipment installers.

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5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
  2. Name and address of the TAB specialist.
  3. Project name.
  4. Project location.
  5. Project Performance Guaranty
  6. Architect's name and address.
  7. Engineer's name and address.
  8. Contractor's name and address.
  9. Report date.
  10. Signature of TAB supervisor who certifies the report.
  11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  12. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  13. Nomenclature sheets for each item of equipment.
  14. Data for terminal units, including manufacturer's name, type, size, and fittings.
  15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.
    - e. Fan drive settings including settings and percentage of maximum pitch diameter.
    - f. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
  2. Duct, outlet, and inlet sizes.
  3. Pipe and valve sizes and locations.
  4. Terminal units.
  5. Balancing stations.
  6. Position of balancing devices.

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- E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.
- F. Test Reports – General:
  - 1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.
- G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - j. Number, make, and size of belts.
    - k. Number, type, and size of filters.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total air flow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Filter static-pressure differential in inches wg.
    - f. Cooling-coil static-pressure differential in inches wg.
    - g. Heating-coil static-pressure differential in inches wg.
    - h. Outdoor airflow in cfm.
    - i. Return airflow in cfm.

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- j. Relief airflow in cfm.
  - k. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
  - l. Return-air damper position.
  - m. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
- H. Apparatus-Coil Test Reports:
  - 1. Coil Data:
    - a. System identification.
    - b. Location.
    - c. Coil type.
    - d. Number of rows.
    - e. Fin spacing in fins per inch o.c.
    - f. Make and model number.
    - g. Face area in sq. ft.
    - h. Tube size in NPS.
    - i. Tube and fin materials.
    - j. Circuiting arrangement.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Average face velocity in fpm.
    - c. Air pressure drop in inches wg.
    - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
    - e. Return-air, wet- and dry-bulb temperatures in deg F.
    - f. Entering-air, wet- and dry-bulb temperatures in deg F.
    - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    - h. Refrigerant expansion valve and refrigerant types.
    - i. Inlet steam pressure in psig.
- I. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
  - 1. Unit Data:
    - a. System identification.
    - b. Location.
    - c. Coil identification.
    - d. Capacity in Btu/h.
    - e. Number of stages.
    - f. Connected volts, phase, and hertz.
    - g. Rated amperage.
    - h. Air flow rate in cfm.

- i. Face area in sq. ft.
    - j. Minimum face velocity in fpm.
  - 2. Test Data (Indicated and Actual Values):
    - a. Heat output in Btu/h.
    - b. Air flow rate in cfm.
    - c. Air velocity in fpm.
    - d. Entering-air temperature in deg F.
    - e. Leaving-air temperature in deg F.
    - f. Voltage at each connection.
    - g. Amperage for each phase.
- J. Fan Test Reports: For supply, return, and exhaust fans, include the following:
  - 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - g. Number, make, and size of belts.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg.
- K. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:

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- a. System and air-handling-unit number.
  - b. Location and zone.
  - c. Traverse air temperature in deg F.
  - d. Duct static pressure in inches wg.
  - e. Duct size in inches.
  - f. Duct area in sq. ft..
  - g. Indicated air flow rate in cfm.
  - h. Indicated velocity in fpm.
  - i. Actual air flow rate in cfm.
  - j. Actual average velocity in fpm.
  - k. Barometric pressure in psig.
- L. Air-Terminal-Device Reports:
  - 1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Apparatus used for test.
    - d. Area served.
    - e. Make.
    - f. Number from system diagram.
    - g. Type and model number.
    - h. Size.
    - i. Effective area in sq. ft.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Air velocity in fpm.
    - c. Preliminary air flow rate as needed in cfm.
    - d. Preliminary velocity as needed in fpm.
    - e. Final air flow rate in cfm.
    - f. Final velocity in fpm.
    - g. Space temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Service.
    - d. Make and size.
    - e. Model number and serial number.
    - f. Water flow rate in gpm.

- g. Water pressure differential in feet of head or psig.
- h. Required net positive suction head in feet of head or psig.
- i. Pump rpm.
- j. Impeller diameter in inches.
- k. Motor make and frame size.
- l. Motor horsepower and rpm.
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. Full-load amperage and service factor.
- p. Seal type.
- 2. Test Data (Indicated and Actual Values):
  - a. Static head in feet of head or psig.
  - b. Pump shutoff pressure in feet of head or psig.
  - c. Actual impeller size in inches.
  - d. Full-open flow rate in gpm.
  - e. Full-open pressure in feet of head or psig.
  - f. Final discharge pressure in feet of head or psig.
  - g. Final suction pressure in feet of head or psig.
  - h. Final total pressure in feet of head or psig.
  - i. Final water flow rate in gpm.
  - j. Voltage at each connection.
  - k. Amperage for each phase.

N. Instrument Calibration Reports:

- 1. Report Data:
  - a. Instrument type and make.
  - b. Serial number.
  - c. Application.
  - d. Dates of use.
  - e. Dates of calibration.

### 3.14 INSPECTIONS

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Measure water flow of at least 5 percent of terminals.
  - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

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- d. Verify that balancing devices are marked with final balance position.
- e. Note deviations from the Contract Documents in the final report.

**B. Final Inspection:**

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
- 2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
- 3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
- 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

**C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:**

- 1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
- 2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
- 3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

**D. Prepare test and inspection reports.**

**3.15 ADDITIONAL TESTS**

- A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Requirements for commissioning of HVAC systems for Title 24 (T-24) compliance.
- B. Scope: Commissioning Coordinator shall complete the building systems commissioning requirements of the California Energy Code, as applicable to Project. It is not the intention of Project specifications to require duplication in testing.
  - 1. T-24 commissioning activities may be coordinated with Contractor tests and TAB work specified in technical Sections.
  - 2. T-24 commissioning activities may be coordinated with LEED and CHPS program commissioning activities, as applicable to Project.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The requirements of this Section apply to all Sections of Division 23.
- C. In the event of conflict between requirements of Division 01 Title 24 commissioning specifications and this Section, Division 01 requirements shall prevail.

### **1.3 REFERENCES**

- A. 2022 California Energy Code.
- B. 2022 California Energy Code and Building Energy Efficiency Standards Reference Appendices.
- C. 2022 Building Energy Efficiency Standards Nonresidential Compliance Manual.

### **1.4 DEFINITIONS**

- A. Commissioning Coordinator: General Contractor, or an entity engaged by the General Contractor to perform T-24 commissioning.
- B. Covered Processes: Process equipment for which there are listed requirements in the California Energy Code.
- C. OPR: Owner's Project Requirements.
- D. TAB: Testing, Adjusting, and Balancing.

### **1.5 SUBMITTALS (FOR RECORD ONLY)**

- A. Submit the following:

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1. Commissioning Plan.
  2. Systems Manual.
  3. Commissioning Report.
  4. Certificates of Installation.
  5. Certificates of Acceptance.
- B. Above items for inclusion in closeout documents submitted to authorities having jurisdiction.

**PART 2 - PRODUCTS**

**2.1 TEST INSTRUMENTS**

- A. Commissioning Coordinator shall supply test instruments. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if recommended by instrument manufacturer, and be checked for accuracy prior to start of work.

**PART 3 - EXECUTION**

**3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES**

- A. Architect/Engineer:
1. Performs construction observation. Provides construction observation reports.
  2. Reviews and approves Commissioning Plan, Systems Manual, and Commissioning Report.
  3. Assists in problem resolution.
- B. Commissioning Coordinator:
1. Coordinates commissioning process.
  2. Develops Commissioning Plan.
  3. Schedules and conducts functional testing. Completes Certificates of Acceptance.
  4. Assembles Systems Manual.
  5. Schedules and conducts systems operations training. Verifies systems operations training completion.
- C. HVAC Subcontractor: Assists in functional testing.
- D. Electrical Subcontractor: Assists in functional testing.
- E. Controls Subcontractor: Assists in functional testing.
- F. TAB Subcontractor: Assists in functional testing.
- G. Equipment Manufacturers/Vendors:

1. Performs Check, Test, and Start of equipment and systems, as required by Project technical Sections.
2. Provides systems and equipment documentation required to complete functional testing and assemble Systems Manual.

### **3.2 COMMISSIONING PLAN**

- A. Commissioning Coordinator shall author the code-required Commissioning Plan. The Commissioning Plan shall address HVAC systems for which commissioning is required. The Commissioning Plan shall be updated by Commissioning Coordinator throughout the construction process. The Commissioning Plan shall contain the following:
1. General Project Information: Commissioning Coordinator shall obtain general Project information from Project architectural Drawings.
  2. Commissioning Goals:
    - a. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
    - b. Verify and document proper integrated performance of equipment and systems utilizing functional testing for mechanical system acceptance, as required by the California Energy Code.
    - c. Verify that Systems Manual documentation is complete.
    - d. Verify that operating personnel are trained to enable them to operate, monitor, adjust, and maintain HVAC systems in an effective and energy-efficient manner.
  3. Commissioning Coordinator shall compile the following information and include in Commissioning Plan:
    - a. An explanation of original design intent: Commissioning Coordinator shall obtain copies of the OPR and BOD for the Project.
    - b. Equipment and systems to be tested, including the extent of tests: Test 100 percent of a given type of installed equipment having associated Acceptance Requirements.
      - 1) Refer to forms MCH-01-E on Drawings for systems to be commissioned.
      - 2) Covered Processes: In addition to systems listed in MCH-01-E on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
        - a) Parking garage ventilation systems.
        - b) Compressed air systems.
        - c) Type 1 Kitchen exhaust systems.
    - c. Functions to be tested: Refer to 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
    - d. Conditions under which the test shall be performed.

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- e. Measureable criteria for acceptable performance: Refer to 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
- f. Commissioning team information:
  - 1) Refer to Project information on architectural Drawings for design team participants. Commissioning Coordinator shall add subcontractor information to provided design team information and include in Commissioning Plan.
- g. Commissioning process activities, schedules, and responsibilities. Plans for the completion of functional performance testing, systems operations training, and commissioning report.

**3.3 CERTIFICATES OF INSTALLATION**

- A. Commissioning Coordinator shall complete applicable Certificates of Installation forms.

**3.4 FUNCTIONAL TESTING REQUIREMENTS**

- A. Contractor shall complete the applicable Acceptance Requirements for Code Compliance contained in the California Building Energy Efficiency Standards. Refer to T-24 compliance forms on Drawings for systems having Acceptance testing requirements. Contractor shall perform Acceptance tests and complete the appropriate "Certificates of Acceptance." Contractor shall engage certified HERS Rater to verify duct leakage rate for duct systems indicated on T-24 compliance forms on Drawings as requiring duct leakage rate testing. For additional duct leak testing requirements, refer to Section 23 8000, "Heating, Ventilating, and Air Conditioning," Article, "Ductwork Sealing and Leak Testing."
- 1. Covered Processes: In addition to systems listed on T-24 compliance forms on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
  - a. Parking garage ventilation systems.
  - b. Compressed air systems.
  - c. Type 1 Kitchen exhaust systems.

**3.5 SYSTEMS MANUAL**

- A. Commissioning Coordinator shall assemble Systems Manual in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications.

**3.6 SYSTEMS OPERATIONS TRAINING**

- A. Commissioning Coordinator shall provide systems operations training in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications.

**3.7 COMMISSIONING REPORT**

- A. Commissioning Coordinator shall complete Commissioning Report in accordance with the requirements of the California Energy Code and Division 01 commissioning specifications.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes equipment and performance criteria for furnishing all labor and materials for the installation and programming for "Pelican" Energy Management System for HVAC Systems utilizing wireless communication with cloud based servers.

### **1.2 RELATED SECTIONS:**

- A. Division 01: General Requirements
- B. Section 23: Heating, Ventilating, and Air-Conditioning (HVAC)

### **1.3 SUBMITTALS:**

- A. Shop Drawings and product data in accordance with the specifications.
- B. All shop drawings shall be prepared in AutoCAD 2000 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.
- C. All submittals shall be bound or in a three ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or engineer for distribution and review.
- D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.
- E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.
- F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

### **1.4 SCOPE OF WORK**

- A. Except as otherwise noted, the control system shall consist of all thermostats, and gateways to fill the intent of the specification and provide for a complete and operable system.

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- B. The EMS Contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.
- D. When the EMS system is fully installed and operational, the EMS Contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the EMS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
- E. The Contractor shall furnish and install a complete EMS control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install EMS controls for the HVAC Equipment as noted on the drawings:
- F. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and the owner's team.
- G. Contractor shall provide one training session in the operation of the system, for owner's personnel.
- H. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

**1.5 SYSTEM DESCRIPTION**

- A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.
- B. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner's wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

**1.6 WORK BY OTHERS**

- A. The EMS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. EMS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.
- B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by the Mechanical Contractor. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's installation instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum 3 conductor / 24 gauge wires per EMS manufacturer's standard specifications, multiple c conductor/24 gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)
- C. Related work provided by others:
  - 1. 110 V outlets shall be provided within 5 feet of each gateway location.
  - 2. 1 Data port shall be provided within 10 feet of each gateway location.
- D. Equipment start-up and servicing

**1.7 CODE COMPLIANCE**

- A. Provide EMS components and ancillary equipment which are code compliant.
- B. All wiring shall conform to the National Electrical Code.
- C. All products of the EMS shall reside with the following agency approvals.
  - 1. California 2022 Title 24 Compliant.
  - 2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
  - 3. OpenADR2.0 certified.

**1.8 SYSTEM STARTUP AND COMMISSIONING**

- A. Each EMS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the EMS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.



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- B. The EMS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The EMS Contractor shall have a trained technician available on request during the balancing of the systems. The EMS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to EMS.

**1.9 TRAINING**

- A. The EMS Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The EMS Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description:
- B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
  - 1. System Overview
  - 2. System Software and Operation
  - 3. System access
  - 4. Software features overview
  - 5. Changing set points and other attributes
  - 6. Scheduling
  - 7. Editing programmed variables
  - 8. Displaying color graphics
  - 9. Running reports
  - 10. Workstation maintenance
  - 11. Application programming
  - 12. Operational sequences including start-up, shutdown, adjusting and balancing.
  - 13. Equipment maintenance

**1.10 OPERATING AND MAINTENANCE MANUALS**

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire EMS. This documentation shall include specific part numbers.
- B. Following project completion and testing, the EMS contractor will submit as-built documentation reflecting the exact installation of the system.

**1.11 WARRANTY**

- A. The EMS Contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the EMS Contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. EMS equipment shall be warranted for a period of 5 years from the time of system acceptance.

- B. Warranty of equipment is limited to replacement of defective products.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems,
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Project Manager at least 10 days prior to bid due date.

### **2.2 WIRELESS GATEWAY (WG)**

- A. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements
- B. The WG must provide the following hardware features as a minimum:
  - 1. Single Ethernet Port.
  - 2. One micro-USB 5VDC power input.
  - 3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.
- C. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).
- D. The WG shall be able to support 2000 Internet Programmable Thermostats.

### **2.3 INTERNET PROGRAMMABLE THERMOSTAT (IPT)**

- A. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.
- B. The IPT shall provide a keypad for setting:
  - 1. Temperature Set points.
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Light Button.

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- C. The IPT shall include a wiring terminal for controlling a single zone HVAC unit. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the HVAC unit it will be controlling. Over these 3-wires the thermostat must still be able to control the HVAC unit based on these specifications.
- D. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:
  - 1. Naming the thermostat
  - 2. Grouping multiple thermostats.
  - 3. Heat Pump or Conventional system setting.
  - 4. If Heat Pump; reversing valve O or B setting.
  - 5. Cycles Per Hour (1 - 6).
  - 6. Anticipation Degrees (0°F - 0.5°F)
  - 7. Calibration Degrees (2.0°F - -2.0°F)
  - 8. Heat Stages (0 - 2)
  - 9. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
  - 10. Cool Stages (0 - 2)
  - 11. Fan Stages (1 - 2)
  - 12. Fan Circulation Minutes Per Hour.
  - 13. Temperature Display (Fahrenheit or Celsius)
  - 14. Heat Range Temperature Setting Limitation
  - 15. Cool Range Temperature Setting Limitation
  - 16. Ability to disable and enable Keypad Control through schedule.
  - 17. Heat consumption (kw, btu, ton, or watt)
  - 18. Cool consumption (kw, btu, ton, or watt)
  - 19. Notification Sensitivity (High, Medium, Low)
  - 20. Alarm of exceeding temperature based on a Safe Range
  - 21. Schedule set times (2, 3, 4, or Variable).
- E. IPT settings and control through the Web Base App shall be in real-time and include:
  - 1. Space Temperature
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Current set point.
  - 5. Relay status (Heat/Cool and Fan).
  - 6. Historical Trend Graphs.
  - 7. Scheduling
  - 8. Lock and Unlock Entire Thermostat's Keypad
  - 9. Lock and Unlock the Thermostat's Fan Mode setting Only

## **2.4 WEB BASED GRAPHICAL USER INTERFACE**

- A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.
- B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.
- C. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.
- D. The Web Based client shall support at a minimum, the following functions:
  - 1. User log-on identification and password shall be required.
  - 2. HTML programming shall not be required to display any graphics or data on the Web page.
  - 3. Storage of data shall reside within the cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or an on-site server is not acceptable.
  - 4. Users shall have administrator and user definable access privileges.
  - 5. OpenAPI interface with XML data output.
- E. Schedules:
  - 1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
  - 2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
  - 3. The WBA shall provide the user the ability to:
    - a. View Schedules.
    - b. Add/Modify Schedules.
    - c. Assign Thermostat to a Group Schedule.
    - d. Delete Schedules.
- F. Trending
  - 1. The WBA shall provide real-time trend information on:
    - a. Each IPT's space temperature.
    - b. Each IPT's temperature set points.
    - c. Each IPT's current call; heat, cool, and/or fan.
    - d. Each IEE's call for economization
  - 2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
    - a. space temperature; with resolution of every 1/10th of a degree Fahrenheit.
    - b. IPT's temperature set points.
    - c. indication of whether the thermostat was calling for; heat, cool, and/or fan.

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3. Trend data shall be viewable on the WBS

**G. Alarm Notifications**

1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
  - a. space temperature and temperature change.
  - b. IPT's temperature set points.
  - c. IPT's current call; heat, cool, and/or fan.
2. The WBA shall be able to provide a user with the ability to:
  - a. View Alarms.
  - b. Set Alarm Notification sensitivity level to High, Medium, or Low.
  - c. Delete Alarms.
3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

**H. Consumption Usage**

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

**2.5 WIRED REMOTE TEMPERATURE SENSORS AND DIGITAL ALARM INPUT**

**A. Input Temperature Sensor (ITS).**

1. The ITS shall connect to the Internet Programmable Thermostat over 3-wires.
2. ITS shall provide at least one external 10K Type II thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past temperature data for ITS.
4. The trend data shall be viewable on the WBA.
5. ITS must be accurate to  $\pm 1.0^{\circ}\text{F}$
6. ITS must be able to be installed up to 500' away from IPT using standard thermostat wiring.

## **2.6 INTERNET ENABLED ECONOMIZER (IEE)**

- A. The IEE shall connect to the Internet Programmable Thermostat (ITS) with ONLY 3-wires. No additional wiring must be required between the IEE and the ITS to gain complete Title 24 compliant economization control.
- B. IEE shall provide up to three 10K Type II external thermistor temperature sensor input.
- C. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:
  - 1. Calls for Economization
  - 2. Outside Air Damper Position
  - 3. Supply and Outside Air Temperature
- D. The trend data shall be viewable on the WBA.
- E. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.
- F. IEE must be able to be installed up to 500' away from IPT using standard thermostat wiring.
- G. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.
- H. IEE must have a settable 0-10VDC output for Variable Frequency Drive (VFD) control.
  - 1. IEE must be configurable for different VFD speeds based on calls for cold, heat, and ventilation.
- I. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.

## **2.7 WIRELESS PROXIMITY SENSORS**

- A. Wireless Proximity Sensor (WPS).
  - 1. The WPS shall connect with the Internet Programmable Thermostat over the 802.15.4 wireless network.
  - 2. WPS shall be powered by 2 AA batteries or equivalent.
  - 3. WPS must be able to be used for either:
    - a. Accepting a motion sensor's 2-wire dry contact output.
      - 1) The WPS shall be able to notify an Internet Programmable Thermostat if a motion sensor's dry contact is in either the open or closed position.
      - 2) Dry contact open positions will indicate that the space is occupied and the IPT must be able to automatically setback its temperature setting by a range of 0F - 10F or OFF.
      - 3) Dry contact closed position will indicate that the space is unoccupied and set the temperature to a comfort setting when the space is occupied.

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- 4) Setback settings and comfort settings must be settable through the Internet Programmable Thermostat's schedule through the Web Based App (cannot be settable at thermostat).
  - 5) Web Based App must be able to display when a space is "Unoccupied".
- b. Detecting if a Window OR Door is Opened or Closed.
  - 1) The WPS must have a built-in magnetic sensor and come with a magnet that can be installed on a door OR window.
  - 2) The WPS must be able to notify an Internet Programmable Thermostat if the door is open and the IPT must automatically turn to the OFF position.
  - 3) The WPS must be able to notify an Internet Programmable Thermostat if the door is closed and the IPT must automatically return to its last temperature and system settings.
  - 4) Web Based App must be able to display when the Door OR Window is Open and must be able to be set to indicate "Door" or "Window".
4. Web Based App shall be able to notify if the WPS batteries are low and record and provide at least two years of past history on occupancy and/or door/window status for each space a WPS is installed in.
5. The trend data shall be viewable on the Web Based App.
6. Internet Programmable Thermostat must be able to connect with at least 8 WPS, each WPS must have a unique serial number and each WPS shall be settable, through the Web Based App, as either a motion sensor input or as a door/window sensor.

**PART 3 - EXECUTION**

**3.1 CONTRACTOR RESPONSIBILITIES**

**A. General**

1. Installation of the Energy Management System shall be performed by an approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.

**B. Demolition**

1. Remove controls which do not remain as part of the Energy Management System. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

**C. Access to Site**

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.

D. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

E. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

**3.2 WIRING, CONDUIT, AND CABLE**

- A. All control wires between HVAC units and thermostat locations to be furnished and installed by the Mechanical Contractor. The EMS Contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the EMS Contractor. The EMS Contractor shall provide wiring between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

**3.3 HARDWARE INSTALLATION**

A. Installation Practices for Devices

1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. Identification

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the EMS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

C. Existing Controls.

1. Existing controls are not to be reused. All EMS devices will be new.

D. Control System Switch-over

1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

E. Location

1. The location of sensors is per mechanical and architectural drawings.



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2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
3. If Input Temperature Sensor(s) (ITS) is used as Outdoor air sensor, outdoor air sensors will be mounted on the north building face directly in the outside air. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
4. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

**3.4 SYSTEM PROGRAMMING**

A. General.

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the Contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

**3.5 COMMISSIONING AND SYSTEM STARTUP**

A. EMS device functional testing.

1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.
2. Please contact Tom Hardy of RSD-Total Control for project quotation @ 916-600-3027.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Fans.
  - 2. Air inlets and outlets.
  - 3. Filters.
  - 4. Dampers.
  - 5. Ductwork.
  - 6. Insulation.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 23 0050, Basic HVAC Materials and Methods.
- C. Section 23 0593, Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 0900, Direct Digital Control (DDC) System for HVAC.

### **1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 0050, Basic HVAC Material and Methods for additional requirements.
  - 1. Upon approval of submittal, provide manufacturer's installation and operating instructions to the Project inspector for the following:
    - a. Fire dampers, smoke dampers, and combination smoke-fire dampers.
    - b. Type 1 kitchen exhaust field applied grease duct enclosures.
- C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

### **1.4 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.

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- B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.
- C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

**1.5 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Belts: One set(s) for each belt-driven unit.
  - 2. Provide one complete set(s) of filters for each filter bank.

**1.6 COORDINATED LAYOUT**

- A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.
- B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to design Drawings.
  - 1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
  - 2. Show on drawings the intended elevation of all ductwork in accordance with the following example:
    - a. B.O.D. = 9'-0"  
OFFSET UP 6"  
B.O.D. = 9'-6"
  - 3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.
- C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

- D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

## **1.7 QUALITY ASSURANCE**

### **A. Design Criteria:**

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

## **1.8 FIELD CONDITIONS**

- A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:
  1. Notify Architect no fewer than two days in advance of proposed interruption of services.
  2. Do not interrupt services without Architect's written permission.

## **1.9 WARRANTY**

- A. Air Cooled Condensing Unit: Unit shall have 5 year limited compressor warranty.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

## **PART 3 - AIR CONDITIONING SYSTEM PRODUCTS**

### **A. SPLIT SYSTEM HEAT PUMPS**

- B. General: Furnish and install split system air-to-air heat pump system, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

### **C. Quality Assurance:**

1. Unit shall be ETL or UL listed and labeled.

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2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
  3. Unit shall be rated in accordance with ARI standard 210.
- D. Delivery, Storage and Handling: Follow manufacturer's recommendations.
- E. Heating/Cooling System: The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.
- F. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.
1. Cabinet:
    - a. Wall mounted: Molded white high strength plastic.
      - 1) Provide wall mounted unit with factory mounting plate.
    - b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
    - c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.
  2. Fans: Double inlet, forward curved, statically and dynamically balanced.
  3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.
    - a. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 0050, Basic HVAC Materials and Methods.
  4. Air Outlet: With motorized horizontal and vertical vanes.
    - a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.
  5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.
  6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.
- G. Outdoor Section:
1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
  2. Condenser Fan Grille: ABS plastic.
  3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
  4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
  5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.
- H. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:
1. Pelican Controls.

2. Test and check functions.
  3. Diagnostic functions.
  4. Vane position control.
  5. Fan speed adjustment.
  6. Temperature adjustment.
  7. Automatic restart.
  8. Mode selection, including heat/auto/cool/dry/fan.
    - a. Provide lockable enclosure for wall mounted controller.
- I. Safeties: Shall include the following, as a minimum:
1. Five minute compressor anti-recycle timer.
  2. High pressure protection.
  3. Current and temperature sensing motor overload protection.
- J. Filters: Provide manufacturers washable filters for indoor unit. Provide sufficient filters for four complete changes for each unit.
- K. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.
- L. Refrigerant Piping:
1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
  2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
- M. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Lennox to match Lodi USD District Standards for Multi-Zone Applications.
- N. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.
- 3.2 AIR COOLED CONDENSING UNIT**
- A. Provide outdoor-mounted, factory assembled, single piece, air-cooled, split-system air conditioner unit suitable for ground or rooftop installation, rated in accordance with ARI Standard 210, and UL or ETL listed and labeled. Provide refrigerant charge R-410A, all internal wiring, piping, controls, compressor, and special features required prior to field start-up. Design unit to conform to the following:
1. ANSI/ASHRAE latest edition.
  2. NEC latest edition.
  3. Unit cabinet to be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hr salt spray test.

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4. Unit shall be constructed in accordance with UL standards.
- B. Unit shall be certified for capacity and efficiency, and listed in the latest ARI directory.
- C. Unit shall be manufactured in a facility registered to ISO 9001:2000.
- D. Unit shall be Energy Star Qualified.
- E. Provide unit with 5 year limited parts warranty.
- F. Cabinet:
  1. Unit cabinet constructed of galvanized steel, bonderized, and coated with powder coat paint.
- G. Fans:
  1. Direct-drive propeller type condenser fan, discharging air vertically.
  2. Totally enclosed condenser fan motors, 1-phase type with Class B insulation and permanently lubricated bearings, and corrosion resistant shafts.
  3. Condenser fan openings equipped with PVC-coated steel wire safety guards.
  4. Statically and dynamically balanced fan blades.
- H. Compressor:
  1. Hermetically sealed compressor mounted on rubber vibration isolators.
  2. Compressor with sound insulator.
- I. Refrigeration Components:
  1. Refrigerant circuit to include liquid and vapor line shut-off valves with sweat connections.
  2. System charge of R-410A refrigerant and compressor oil.
  3. Unit to be equipped with factory-supplied high-pressure switch, low pressure switch, and filter drier.
  4. Provide unit with manufacturer's refrigerant line set.
  5. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
- J. Condenser Coil:
  1. Air-cooled condenser coil constructed of aluminum fins mechanically bonded to copper tubes.
  2. Coils shall be leak and pressure tested.
- K. Electrical Requirements:
  1. Unit shall have single point power connection.
  2. Provide unit with 24V control circuit.

- L. Operating Characteristics:
  - 1. Unit shall be capable of starting and running a 115 degrees F ambient outdoor temperature per maximum load criteria of ARI Standard 210.
  - 2. Compressor with standard controls shall be capable of operation down to 55 degrees F ambient outdoor temperature.
- M. Provide the following additional components and features:
  - 1. Provide evaporator freeze thermostat, winter start control, compressor start assist capacitor and relay, low ambient controller, and ball bearing fan motor.
  - 2. Provide expanded metal coil guard for all sides of the air cooled condensing unit. Coil guard shall be as manufactured by MicroMetl, Can-Fab, or equal.
- N. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Carrier Corporation.
  - 2. Trane Inc.
- O. Owner Training: Manufacturer shall provide one on-site 1-hour training sessions for Owners' maintenance personnel.

### **3.3 COOLING COIL**

- A. Provide direct expansion encased cooling coil.
  - 1. Install encased coil to operate properly in vertical or horizontal position as required. Construct coil with aluminum plate fins mechanically bonded in non-ferrous tubing with all joints brazed ultrasonically. Coil shall have factory-installed refrigerant metering device, refrigerant line fittings which permit mechanical connections, and condensate pan with primary and auxiliary drain connections.
  - 2. Construct casings of galvanized steel, bonderize, insulate, and finish with baked enamel.

### **3.4 REFRIGERATION PIPE AND FITTINGS**

- A. Refrigeration gas and liquid piping shall be type ACR hard drawn copper tubing, cleaned and capped in accordance with ASTM B280, with wrought copper fittings. All joints shall be brazed with Sil-fos under nitrogen purge. Relief valve discharge piping shall be full size of relief discharge port.
  - 1. Manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping may be utilized at Contractor's discretion.
    - a. Heat Pump Systems: Use of manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping between outdoor condensing units and indoor heat recovery controllers, or distribution headers and tees is not allowed. When system manufacturer's installation instructions allow use of refrigerant line-set piping between indoor heat recovery controllers, or distribution headers and tees, and air terminal devices, follow instructions for allowable pipe size range and support to avoid forming traps in the piping.



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- B. Refrigeration Piping Specialties: Furnish and install Superior, Sporlan, Alco, Henry, or equal, stop valves, solenoid valves, adjustable thermal expansion valves, sight glass, flexible connection, charging valve, and drier with valve bypass in the liquid lines and Superior DFN shell and cartridge suction line filter sized 2-1/2 times tonnage.

- 1. Install only those refrigeration piping specialties recommended by manufacturer of specific installed equipment.

**3.5 REFRIGERANT ACCESS VALVE LOCKING CAPS**

- A. Each refrigerant circuit access valve located outside buildings, including valves located on roofs, shall be provided with a locking cap. Caps shall be of metal construction, with threaded brass inserts. Caps shall be color-coded according to ASHRAE standards for R22 and R410A refrigerant gasses, universal color for other refrigerant gasses. Caps shall be removable only with cap manufacturer's handheld tool.

- 1. Provide minimum of two (2) cap removal tools for every ten (10) air conditioning units or other systems containing refrigerant installed under this Project.

**3.6 AIR INLETS AND OUTLETS**

- A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Ceiling, wall or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.
- C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

**3.7 AIR FILTERS**

- A. Provide MERV 13 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:
  - 1. Standards:
    - a. ASHRAE Standard 52.2-2007.
    - b. Underwriters Laboratories: U.L. 900, Class 2.
  - 2. Construction:
    - a. Media: Synthetic or cotton-synthetic blend with radial pleats.
    - b. Media Frame: High wet-strength beverage board.
    - c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.
  - 3. Performance: 2" deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Camfil Farr, Inc., model 30/30.
  - 2. Flanders Corporation, model 40 LPD.
- C. Temporary (Construction Period) Filters:
  - 1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer's directions, in order to provide protection for the unit prior to occupancy by the Owner.
  - 2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.
- D. Spare Filters:
  - 1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

### **3.8 DAMPERS**

- A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.
- B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.
  - 1. Rectangular Ductwork:
    - a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
    - b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
    - c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.
  - 2. Round Ductwork:
    - a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
    - b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches

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damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.

3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

**C. Fire Dampers and Combination Fire/Smoke Dampers:**

1. Fire dampers and combination fire/smoke dampers shall be listed and approved by the California State Fire Marshal. Installation shall conform to the manufacturer's UL approved installation instructions.
  - a. Fire dampers shall be UL 555 classified and labeled as dynamic fire dampers approved for wall and floor installation. They shall ship from the manufacturer as an assembly with a minimum 20-gauge factory installed sleeve. Sleeve length shall suit the requirements of the wall construction. Each dynamic fire damper/sleeve assembly shall ship complete with factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dynamic fire dampers for vertical installation must consist of a single section on sizes up to 33" x 36" and a single section on sizes up to 24" x 24" for horizontal installation. 1-1/2 hour dynamic fire dampers shall be Ruskin DIBD20, Pottorff, or equal. 3 hour dynamic fire dampers shall be Ruskin DIBD230, Pottorff, or equal.
  - b. Fire dampers for high pressure/velocity systems where velocities exceed 2000 fpm and/or 4" w.g. pressure fire damper shall be Ruskin FD60, Pottorff, or equal
  - c. Fire dampers for ceiling installation shall be UL 555C classified and labeled as ceiling dampers. They shall be provided with a thermal insulating blanket to fit the inlet or outlet condition if required by the application. Ceiling dampers shall be Ruskin CFD 2, 3, 4 or 5. Ceiling dampers for ceilings constructed of wood shall have UL tested in design L501 and shall be Ruskin CFD7, Pottorff, or equal.
  - d. Combination fire/smoke dampers. Dampers shall be UL classified and labeled as Leakage Class I Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall be warranted to be free from defects in material and workmanship for a period of 5 years after date of shipment. Damper/actuator assembly shall be tested to full open and full close at minimum 2000 fpm 250° F heated air and 4" w.g. with airflow in both directions. (Specified select: 250° / 350°, 2000 fpm/3000 fpm). Each damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage resulting from instantaneous damper closure. Release device shall be EFL type and shall allow reset from outside the sleeve after moderate temperature exposure. (Replacement type fusible links not acceptable.)
  - e. Two position combination fire smoke dampers shall be equipped with one or more factory installed, direct coupled, 120 volt, single phase, electric actuator for energize open – fail close operation. Dampers with multiple actuators shall be factory wired with single point connection at the EFL heat release device for connection to poser. Damper actuator shall include

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minimum one-year energized hold open (no cycles) and spring return (fail) close reliability. Damper/actuator shall include minimum 20,000 full open-full close cycle performances.

- f. Modulating combination fire smoke dampers shall be equipped with one or more factory installed contact for modulating signal connection. Damper/actuator shall include minimum 100,000 full open-full close cycle performances with spring return (fail) close on loss of power.
- g. Round combination fire smoke dampers up to 24" diameter shall be true round type with minimum 20 gauge galvanized steel designed for lowest pressure drop and noise performance. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17 inches minimum length and factory "roll formed" one-piece angles with pre-punched holes. Dampers shall be Ruskin FSDR25, Pottorff, or equal.
- h. Round (larger than 24" diameter) or rectangular combination fire smoke dampers shall include roll-formed structural hat channel frame, reinforced at the corners, formed from a single piece of minimum 16 gauge equivalent thickness formed from single piece galvanized steel. Bearings shall be stainless steel turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17" minimum length and factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dampers shall be Ruskin FSD60, Pottorff, or equal.
- i. 3-hour rated combination fire smoke dampers shall be Ruskin model FSD60-3, Pottorff, or equal.
- j. All FSD60 type dampers shall be AMCA licensed and shall bear the AMCA Seal for Air Performance. AMCA certified testing shall verify pressure drop does not exceed .03" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper.
- k. Wall type fire/smoke damper:
  - 1) Combination fire/smoke dampers for use in the wall of exit corridors shall be classified and labeled as Leakage Class II Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall meet the requirements for combination fire/smoke dampers in paragraph 3 above except AMCA certified testing shall verify pressure drop does not exceed .07" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper and blades shall be single skin galvanized steel 10 gauge minimum with 3 longitudinal grooves for reinforcement. Dampers shall be Ruskin FSD36, Pottorff, or equal.
  - 2) Front access combination fire/smoke dampers shall meet all the requirements for combination fire/smoke dampers in paragraph 3 above except pressure drop requirement. In addition the dampers shall be constructed so that actuators and all accessories are accessible from the grille side. Actuators and accessories shall be housed within an integral cabinet on the side of the damper frame and

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shall not be installed in the air stream in front of the damper. The damper sleeve shall be minimum 14" and flanged to accept a steel framed grille. The sleeve shall be covered with fire resistant material. Dampers shall be Ruskin FSD60FA, Pottorff, or equal.

- I. Ceiling type fire/smoke damper for tunnel type corridor construction: Combination fire/smoke dampers for use in the corridor ceiling of tunnel type corridor construction shall be UL classified and labeled as Corridor Damper. Dampers shall meet the requirements of paragraph 4a above except pressure drop testing does not require AMCA certification. Dampers shall be Ruskin FSD36C, Pottorff, or equal.
  - m. Fusible links shall have temperature rating approximately 50° F above normal maximum operating temperature of the heat producing appliance.
    - 1) If project requires re-openable fire/smoke dampers, provide Ruskin 165 ° F / 350° F TS150, NCA or equal. The TS150 firestat replaces the EFL and allows the damper to be re-opened from remote location up to 350 ° F. TS150 shall include full open and full closed damper position contacts for interface with remote position indication panel.
    - 2) Each fire/smoke damper shall be equipped with “controlled closure” quick detect heat actuated release device to prevent duct and HVAC component damage. Release device shall allow easy reset after moderate temperature rise outside the sleeve. Heat release device shall be the Ruskin EFL, NCA or equal.
    - 3) Unless the system is using a validation control system, each fire/smoke damper shall be equipped with a control panel including blade position indicator lights and a key operated switch. The panel cover shall be oversized for flush mount into the wall or ceiling and shall have a brushed look. Control panel shall be Ruskin MCP2, Pottorff, or equal.
  - 2. All actuators used for smoke dampers or combination fire/smoke dampers shall have a cycle time requirement of not more than every twelve months and shall be rated for continuous "On" duty and shall be provided with internal spring return. Actuators shall be equipped with pilot light, remote key test switch, end switch and circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper. Electric motors shall be Invensys MA-250, MA-253, Honeywell H2000, or equal.
- D. Where required to suit the size of damper required, provide manufacturers standard UL Classified mullions, arranged to support multiple dampers. Assembly shall be of minimum 16 gauge galvanized steel, complete with all accessory caps and framing members required for installation.

### 3.9 DUCTWORK

- A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.
  1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and

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install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.

2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.
3. Gauges, joints and bracing shall be in accordance with the California Mechanical Code.
4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.
  - a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
  - b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

**B. Design and installation standards:**

1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.
2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
3. California Mechanical Code.

**C. Duct sizes indicated are external sizes.**

**D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.**

1. Provide mill certification for galvanized material at request of the Project Inspector.

**E. Duct Sealants:**

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.

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- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1) Design Polymerics, model DP1010.
  - 2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
  - 3) McGill Airseal, LLC.
- F. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
- G. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.
- H. Rectangular Duct Fabrication:
  - 1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
    - a. SMACNA HVAC Duct Construction Standards
    - b. California Mechanical Code
  - 2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

<u>Table A</u>		
<u>Duct Dimension</u>	<u>Minimum Gauge</u>	<u>Joint Reinforcement Per CMC</u>
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4

- 3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
- 4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph "DAMPERS" for damper requirements.
- 5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

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6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

I. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.
2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.
3. Duct Access Panels:
  - a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:
    - 1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
    - 2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

J. Flexible Connectors:

1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - a. Minimum Weight: 26 oz./sq. yd.
  - b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
  - c. Service Temperature: Minus 50 to plus 200 deg F.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Ductmate Industries, Inc., model Proflex.
  - b. Ventfabrics, Inc., model Ventlon.

**3.10 PIPE JOINING MATERIALS**

- A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.



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**B. Brazing Filler Metals:**

1. General Duty: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
2. Refrigerant Piping:
  - a. Joining copper to copper: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
  - b. Joining copper to bronze or steel: AWS A5.8, Bag-1, silver alloy unless otherwise indicated.

**3.11 INSULATION MATERIALS**

**A. General:**

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

**B. Insulation Materials:**

1. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) Aeroflex USA, Inc.
    - 2) Armacell LLC.
    - 3) K-Flex USA.
2. Mineral-Fiber, Preformed Pipe Insulation:
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) Johns Manville; a Berkshire Hathaway company.
    - 2) Knauf Insulation.
    - 3) Manson Insulation Inc.
    - 4) Owens Corning.

- b. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.
- 3. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) CertainTeed Corporation.
    - 2) Johns Manville.
    - 3) Knauf Insulation.
    - 4) Owens Corning.

**3.12 FIELD APPLIED JACKETS:**

- A. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 2. Johns Manville, model Zeston, with Zeston 2000 fitting covers.
  - 3. Proto Corporation, model LoSmoke.
- B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. ITW Insulation Systems; Illinois Tool Works, Inc.
    - c. RPR Products, Inc.
  - 2. Finish and thickness are indicated in field-applied jacket schedules.
  - 3. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
  - 4. Factory-Fabricated Fitting Covers:
    - a. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - b. Tee covers.
    - c. Flange and union covers.
    - d. End caps.
    - e. Beveled collars.
    - f. Valve covers.

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- g. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

**3.13 TEMPERATURE CONTROL SYSTEM**

- A. Refer to Section 23 0900, Pelican Control System for HVAC to match District Standards.

**PART 4 - EXECUTION**

**4.1 ROOF MOUNTED EQUIPMENT INSTALLATION**

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.
- B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.
- C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.
- D. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.
- E. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2 inch thick, 3 pound density fiberglass insulation board.
- F. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors. Provide G 90 galvanized steel weather hood over flexible connections exposed to the weather. Weather hood minimum gauge shall be per PART 2 article, Ductwork, Table A.
- G. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

**4.2 SPLIT SYSTEM AC, AND HEAT PUMP SYSTEMS INSTALLATION**

- A. General:
  - 1. Install units level and plumb.
  - 2. Install evaporator-fan components as detailed on Drawings.
  - 3. Install ground or roof- mounted condensing units as detailed on Drawings.
  - 4. Install seismic restraints as required by applicable codes. Refer to Article, Submittals, in Section 23 0050, Basic HVAC Materials and Methods, for delegated design requirements for seismic restraints.
  - 5. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
  - 6. Install cooling coil condensate primary drain pan piping, and overflow, if provided, and run to nearest code-compliant receptacle, or as indicated on Drawings. Install

secondary drain pan for units installed over permanent and suspended-tile ceilings. Install secondary drain pan piping and terminate 1/2 inch below ceiling, with escutcheon, in a readily visible location or as shown on Drawings.

7. Install air filters at each indoor unit. Install washable, permanent filters at indoor units designed to accept washable, permanent filters. Refer to Drawings schedule, and Article, Air Filters, in this Section, for filter requirements for ducted, above-ceiling units incorporating mixing boxes.
8. Duct Connections: Duct installation requirements are specified in Article, Ductwork, in this Section. Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Article, Ductwork, in this Section.

#### **4.3 REFRIGERANT PIPING INSTALLATION**

**A. General:**

1. Install refrigerant piping according to ASHRAE 15. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
2. Install piping straight and free of kinks, restrictions or traps.
3. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
4. Slope horizontal suction piping 1 inch/10 feet towards compressor.
5. Install fittings for changes in direction and branch connections.
6. Piping under raised floors shall be kept 6 inches minimum above ground; excavate as necessary.
7. Install locking caps on refrigerant access valves located outside building, including valves located on roofs.
8. Insulate refrigerant piping, including liquid and hot gas pipes when required by system manufacturer, and including headers, branches, and other components as detailed in unit manufacturers' literature.

**B. Factory Pre-charged and sealed line set piping:**

1. Keep the entire system clean and dry during installation.
2. All tubing shall be evacuated and sealed at the factory. The seal must not be broken until ready for assembly.
3. If there is any evidence of dust, moisture, or corrosion, the tubing must be cleaned out by drawing a swab soaked with methyl alcohol through the tubing as many times as necessary to thoroughly clean the tubing.
4. Where line set piping is used, enclose in iron or steel piping and fittings or in EMT conduit.

**C. Field Assembled Refrigerant Piping:**

1. Select system components with pressure rating equal to or greater than system operating pressure.

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2. Where subject to mechanical injury, enclose refrigerant piping in EMT conduit.
3. Where field assembled refrigerant piping is exposed mounted at grade, on walls, and on roof, enclose in 16 gage galvanized steel enclosure.
4. When brazing, remove solenoid valve coils and sight glasses, also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

**4.4 FAN INSTALLATION**

- A. Ceiling Mounted Fans: Mount variable speed switch within fan housing. Mark final balance point on variable speed switch.
- B. Provide access doors for fans or motors mounted in ductwork.
- C. Mount all fans as detailed on Drawings and in compliance with CBC standards.
- D. Fan motors mounted in air-stream to be totally enclosed.
- E. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.
- F. Roof fans shall be mounted level.
- G. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

**4.5 AIR INLETS AND OUTLETS INSTALLATION**

- A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
- B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.
- C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.
  1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
  2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.

3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.
- D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.
- E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

#### **4.6 FILTER HOUSING INSTALLATION**

- A. Mount filters in airtight galvanized steel housings furnished by the filter manufacturer, or shop-fabricated. Housings shall incorporate integral tracks to accommodate filters, and flanges for connection to duct or casing system.
  1. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.
  2. Access Doors: Hinged, with continuous gaskets on perimeter and positive-locking latch handle devices.
- B. Air filters shall be accessible for cleaning or replacement.
- C. Identify each filter access door with 1/2 inch high minimum stenciled letters.

#### **4.7 TEMPORARY FILTERS**

- A. Provide temporary filters for fans that are operated during construction; after construction dirt has been removed from the building install new filters at no additional cost to the Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.
  1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

#### **4.8 DAMPER INSTALLATION**

- A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.
- B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.
- C. Install fusible link fire dampers full size of duct at points where shown or required.
- D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.

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1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

**4.9 DUCTWORK INSTALLATION**

- A. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.
- B. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealer shall be fire retardant. Sheet metal screw for joints shall be minimum #10 size galvanized.
- C. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw

- D. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger

- E. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.
- F. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.

1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

#### **4.10 PIPE JOINTS AND CONNECTIONS**

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Copper Pipe and Tubing: All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except pneumatic control piping, and hydronic piping having grooved-end fittings and couplings.

C. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
3. Anchor piping securely on the system side of each flexible connection.

#### **4.11 INSULATION AND FIELD-APPLIED JACKET INSTALLATION**

A. General:

1. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
2. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
3. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
4. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, ductwork, and equipment.
5. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.



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6. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
7. Install insulation with longitudinal seams at top and bottom of horizontal runs.
8. Install multiple layers of insulation with longitudinal and end seams staggered.
9. Keep insulation materials dry during application and finishing.
10. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
11. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
12. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
13. For piping, ductwork, and equipment, with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
14. Repair all damage to existing pipe, duct and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.
15. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - a. Install insulation continuously through hangers and around anchor attachments.
  - b. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - c. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - d. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

**B. Piping Insulation Installation:**

1. General:
  - a. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - b. Provide removable insulation covers for items requiring periodic service or inspection.
  - c. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation.
  - d. Provide pre-formed PVC valve and fitting covers for indoor piping.

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- e. Provide factory-fabricated aluminum valve and fitting covers for outdoor piping.
  - f. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
2. Below-Ambient Services Including Chilled Water Supply and Return and Refrigerant Piping:
- a. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of woven glass fiber cloth saturated in Foster Sealfas 30-36, 3M, or equal, extending 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC or aluminum fitting covers.
  - b. Variable refrigerant flow (VRF) heat pump systems: Insulation for VRF system refrigerant piping shall be installed according to VRF unit manufacturer's instructions.
3. PVC Jacket Installation:
- a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
    - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
4. Aluminum Jacket Installation:
- a. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
- C. Duct Insulation Installation:
1. General:
- a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
  - b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.

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- c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.
  - 2. Mineral Fiber Blanket Installation:
    - a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.
  - 3. PVC Jacket Installation:
    - a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
      - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Equipment Insulation Installation:
- 1. General:
    - a. Insulate pumps, coil u-bends where exposed outside airstream, air separators, heating hot water and chilled water storage tanks, and other elements that are in series with the fluid flow, according to the requirements of the California Energy Code.
  - 2. Mineral-Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.
    - a. Apply adhesives according to manufacturer's recommended coverage rates per unit area, and for percent coverage of tank and vessel surfaces.
    - b. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
    - c. Protect exposed corners with secured corner angles.
    - d. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
      - 1) Do not weld anchor pins to ASME-labeled pressure vessels.
      - 2) Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
      - 3) On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
      - 4) Do not overcompress insulation during installation.
      - 5) Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.

- 6) Impale insulation over anchor pins and attach speed washers.
- 7) Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- e. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
- f. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
- g. Stagger joints between insulation layers at least 3 inches.
- h. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
- i. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- j. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
3. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
  - a. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
  - b. Seal longitudinal seams and end joints.

#### **4.12 DUCTWORK SEALING AND LEAK TESTING**

- A. All ductwork shall receive a Class A seal.
- B. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in conditioned space.
- C. Leakage Classes:

<u>Pressure Class</u>	<u>Leakage Class</u>	
	<u>Round Duct</u>	<u>Rectangular Duct</u>
2"W.G. or less	8	16
4"W.G. or greater	2	4

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- D. All duct systems (supply, return, outside air intake, and exhaust), except those identified on compliance forms on Drawings as requiring Acceptance Testing per the requirements of the California Energy Code, shall be tested in accordance with the requirements of SMACNA "HVAC Air Duct Leakage Test Manual." Test pressure shall be equal to the pressure class of the duct. For additional duct leak testing requirements, refer to Section 23 0800.13, "Title 24 Commissioning of HVAC."

**4.13 TEMPERATURE CONTROL SYSTEM INSTALLATION**

- A. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type. System shall be Pelican to match District Standards.

**4.14 EQUIPMENT START-UP**

- A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.
- B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.
- C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of controls contractor, start-up technician, and test and balance contractor; all to work in concert to assure that the systems are started, balanced, and operate in accordance with the design.
- D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.
- E. For additional requirements, refer to article, Check, Test and Start Requirements, in Section 23 0050, Basic HVAC Materials and Methods.

**4.15 TESTING AND BALANCING**

- A. For testing and balancing requirements, refer to Section 23 0593, Testing and Balancing for HVAC.

**4.16 CLEANING AND PROTECTION**

- A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.
- B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.
- C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.

- D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

#### **4.17 EQUIPMENT MOUNTING**

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

#### **4.18 INDOOR PIPING INSULATION SCHEDULE**

- A. Refrigerant Piping:
  - 1. All pipe sizes: Insulation shall be one of the following:
    - a. Suction piping smaller than 1-1/2 inches diameter:
      - 1) Flexible Elastomeric: 1/2 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1/2 inch thick.
    - b. Suction piping 1-1/2 inches diameter and larger:
      - 1) Flexible Elastomeric: 1 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1 inch thick.
    - c. Suction piping for heat pump applications smaller than 1 inch diameter:
      - 1) Flexible Elastomeric: 1 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1 inch thick.
    - d. Suction piping for heat pump applications 1 inch and larger:
      - 1) Flexible Elastomeric: 1-1/2 inches thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1-1/2 inches thick.
  - 2. When equipment manufacturers' instructions indicate that refrigerant liquid and hot-gas gas piping be insulated, insulation thickness shall be equal to, and applied as described herein for refrigerant suction piping.

#### **4.19 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

- A. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1-1/2 inches thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.
  - 2. When equipment manufacturers' instructions indicate that refrigerant liquid piping be insulated, insulation thickness shall be equal to, and applied as described herein for refrigerant suction piping.

#### **4.20 INDOOR FIELD-APPLIED PIPING JACKET SCHEDULE**

- A. Piping, concealed: None.
- B. Piping, exposed: PVC, 20 mils thick.

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**4.21 OUTDOOR FIELD-APPLIED PIPING JACKET SCHEDULE**

- A. All Piping: Aluminum, Stucco Embossed: Thickness as follows:

<u>Outer Insulation Diameter (Inches)</u>	<u>Minimum Aluminum Jacket Thickness (Inch)</u>	
	<u>Rigid Insulation</u>	<u>Non-Rigid Insulation (Note 1)</u>
8 and Smaller	0.024	0.024

1. Note 1: Non-rigid Insulation is defined as having a compressive strength of less than 15 psi.

**4.22 INDOOR DUCT INSULATION SCHEDULE**

- A. Minimum R-Value = R-4.2.
- B. Supply and Return Ducts: Mineral Fiber Blanket, 1-1/2 inches thick, 0.75 lb/cu. ft.

**4.23 OUTDOOR DUCT INSULATION SCHEDULE.**

- A. Refer to article, Ductwork, for double-wall ductwork with interstitial insulation.

**4.24 INDOOR FIELD-APPLIED DUCT JACKET SCHEDULE**

- A. Insulated ducts in concealed spaces: None.
- B. Insulated ducts in exposed unconditioned spaces: PVC, 20 mils thick.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 CONDITIONS OF THE CONTRACT**

- A. The Conditions of this Contract (General, Supplementary, and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of this Section.
- B. Division-15 Mechanical sections apply to work of this section.

### **1.2 WORK INCLUDED**

- A. Types of Multizone Units required for project include the following: Modular-Split System - Penthouse
- B. MANUFACTURER: Subject to compliance with requirements, provide multizone units of the following manufacturer or Owner pre-approved equal, prior to bid:
  - 1. Custom Mechanical Equipment, Inc.
- C. Refer to drawings in this bid set for units to be provided.

### **1.3 QUALITY ASSURANCE**

- A. FLAME-SMOKE RATINGS: Except as otherwise indicated, provide thermal insulation with flame- spread index of 25 or less, fuel-contributed index of 50 or less, and smoke-developed index of 50 or less.
- B. AMCA STANDARDS: Comply with Air Movement and Control Association (AMCA) Standards as applicable to testing and rating fans.
- C. SMACNA COMPLIANCE: Comply with Sheet metal and Air-Conditioning Contractors National Association (SMACNA) ductwork construction standards as applicable to multizone units.
- D. ETL, AGA, & UL COMPLIANCE: Provide electric components for multizone units which have been listed and labeled by Underwriters Laboratories or by a testing organization of equal standing.
- E. ENERGY STAR LABEL: Provide written confirmation of listing of all furnaces in the "Directory of Certified Gas Fan-Type Central Furnaces", and furnaces must have the Energy Star® label.

### **1.4 SUBMITTALS**

- A. PRODUCT DATA: Submit manufacturer's specifications for multizone units showing dimensions, weight, capacities, ratings, certified fan performance with operating point clearly indicated, motor electrical characteristics, gauges and finishes of materials, and installation instructions.



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- B. **MAINTENANCE DATA:** Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals only.

**PART 2 - MATERIALS**

**2.1 SPLIT SYSTEM HVAC UNITS**

- A. **GENERAL:** Furnish and install multizone systems, complete with Open Protocol Direct Digital Controls, by Alerton or Owner pre-approved equal. The units shall be a standard product of a firm regularly engaged in the manufacture of heating/cooling equipment. The equipment shall be shipped completely factory tested and internally ready for field connections. Provide thermal overload protected motors.
1. All wiring shall be in compliance with NEC.
- B. **HEATING/COOLING SYSTEM:** The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.
- C. **SPECIFIED EQUIPMENT:** Approved equipment must include multiple independent heating, cooling, fan and economizer sections to provide system redundancy, improve reliability, increase system efficiency, and reduce energy usage. Equipment that requires reheat will not be acceptable. Any manufacturer not meeting these specifications must provide a detailed explanation of the deviation(s) from the specifications and all performance information necessary for the owner to complete a comparative life cycle cost analysis. The Owner reserves the right to reject any bids not meeting all specifications.
- D. **TECHNICAL SPECIFICATIONS:** The gas fired multizone units shall be factory assembled one- piece penthouse design and be listed by ETL as an approved HVAC appliance. The following components shall be factory installed, wired and plumbed inside the penthouse:
1. High efficiency two-stage, heating section (minimum 95% AFUE)
  2. Evaporator coils
  3. Fully modulating economizer dampers
  4. Low voltage control center
  5. Line and low voltage wiring in the penthouse
  6. Gas lines with single point exterior connection
  7. Condensate piping to single point interior connection
  8. Refrigerant piping to exterior of penthouse
  9. Combustion intake and exhaust piping to termination point
  10. Supply air zone head matching existing ductwork
  11. Interior lights and ground fault convenience outlet
  12. 30% efficient 2" MERV13 pleated filters
  13. Barometric pressure relief dampers

14. Condenser rails for mounting condensers
  15. Main exterior electrical disconnect switch
  16. Step-down transformers
  17. Phase Protection
  18. Open protocol DDC Controller – BacNet Web Ready
- E. **STRUCTURE AND INSTALLED COMPONENTS:** Penthouse shall be constructed of coated, high ribbed galvanized steel siding and trim (25 year performance warranty) with R-9 insulation. Standard color is burnished slate. All louvers shall be coated to match the penthouse with integral bird screen. Unit base shall be designed to set on existing roof curbs and use existing ducts without the need for any transition curb or ducts. Lifting lugs shall be provided for rigging.
- F. **SERVICE ACCESS:** All components, wiring, and inspection areas shall be completely accessible through removable panels or doors.
- G. **HEATING:** Heating shall be high efficiency two stage condensing type, utilizing outside air for combustion. Units shall be certified with AGA laboratories and the ratings certified by GAMA, tested according to DOE test procedures and FTC labeling regulations. Unit shall be available for use with LPG/propane as an option. The units shall be Lennox EL296UH090XV60C with A.F.U.E. of 96.0%.
- H. **SUPPLY AIR FAN:** An independent, 1 Hp fan section is required for each heating section. Each blower assembly shall be statically and dynamically balanced. Maximum speed is 1100 RPM. Blower speed shall be reduced a minimum of one third of the design rotational speed to lower energy costs and reduce drafts when space conditions allow. Fan speed must be adjustable through digital blower balancing control within the user interface or the BAS. Change in blower speed must be gradual utilizing a VSM (DC) motor or Variable Frequency Direct Drive. Control sequence and equipment must be pre-approved by the Owner. Belt-driven fans shall not be acceptable. The entire assembly shall be resiliently rubber mounted.
- I. **COOLING:**
1. An independent, direct expansion single-stage cooling system shall be provided for each heating section. Evaporator coils shall be made with seamless copper tubing, aluminum fins mechanically bonded to durable copper tubes, and galvanized steel frame. Balanced port, adjustable thermal expansion valves shall be factory-installed. Refrigerant shall be R-410a. Each coil shall be thoroughly tested under high pressure and charged with nitrogen prior to shipment to further assure leak-proof construction.
  2. An independent air-cooled condensing unit shall be provided for each cooling coil. Units shall be set directly on the roof or on the existing roof curb using devices provided by the manufacturer.
  3. Condenser fan shall be TEFC, permanently lubricated direct drive motor with vertical discharge, rain shield and louvered steel top fan guard. All refrigerant piping shall be type "L" hard drawn refrigerant grade copper tubing. Backseating brass service valves shall provide access to refrigerant system. Field installed piping shall be as required by the manufacturer.

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4. Condenser coil is to be factory tested to insure leak-proof construction. Entire coil shall be accessible for cleaning. Refrigerant compressor shall be a Copeland Compliant Scroll. Unit shall be rated for a minimum 11.3 EER at ARI conditions with the evaporator coil and condenser section provided. The compressor shall be resiliently mounted, have built-in crankshaft lubrication, crankcase heater, discharge temperature limited, and current-and temperature- sensing motor overloads.
  5. The system shall be protected by high and low pressure switches and a five-minute compressor timed off cycle controller (anti-recycle timer).
  6. Unit Casings: Design for outdoor installation and provide weather protection for components and controls and have a PVC coated steel wire coil guard.
- J. ECONOMIZERS: An independent economizer section shall be provided for each heating section. Units shall be fully modulating with enthalpy or dry-bulb changeover and a manually adjustable minimum damper position. Outdoor air intake damper leakage shall not exceed three cfm/sq. ft. at 3" static pressure differential across the damper.
- K. FILTERS: Sufficient surface area on 2" pleated, 30% efficient filters shall be provided (Farr 30/30 or equivalent). All air shall pass through these filters prior to entering any fan, coil or heat exchanger.
- L. UNIT CONTROL – DDC CONTROLLER SPECIFICATION:
1. The controller used shall be 32-bit microprocessor based and graphically programmable to control each unit with 148 input/output (I/O) points:
    - a. Up to 76 universal inputs (individually jumper-selectable to select either a dry contact, thermistor, 0-20 mA, 0-5 VDC, 0-10 VDC, or RTD...with 12-bit resolution on all analog inputs)
    - b. Up to 40 digital outputs (relayed outputs with individual LED indication and individual HOA switches)
    - c. Up to 40 analog outputs (0-10 VDC or 0-20 mA)
  2. Capacity requirements greater than 148 I/O's can be added as an option. The maximum number of inputs and outputs the controller can accept is 180 (92 universal inputs, 48 digital outputs and 48 analog outputs).
  3. The controller must be capable of sensing CO2 levels by zone and modulating the fresh air by zone to established levels if required.
  4. There shall be no limits on the number of control loops that the controller can handle nor any programming limitations imposed. The controller shall have an on-board, jumper-selectable EIA-232 or EIA-485 open protocol port that supports the following communication protocols: BACnet (modes supported: MS/TP, PTP, and ARCnet), Modbus (modes supported: RTU and ASCII), N2 Bus, and LonWorks. If a controller does not support all of these protocols, then the equipment manufacturer shall include and provide in their price all of the necessary additional communication gateway(s) to support all of these protocols.
  5. All programming memory shall be stored in 16 MB non-volatile battery-backed RAM (with 12 MB available for use), 8 MB Flash Memory and 32-bit memory bus, thus requiring no battery-backup and providing for rugged electrical noise immunity. The controller shall contain an on-board battery- backed (up to 10

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years) hardware clock for stand-alone scheduling capability and accurate recording of date/time on alarm events and data logging. The time/date maintained by the hardware clock shall automatically adjust for daylight savings time and leap years.

6. As simple-to-use keypad/display (KPD) unit with a minimum 4 line by 40 characters per line backlit LCD with 22 function buttons will be supplied with each unit. Software and hardware features of the KPD shall include:
  - a. Custom definable displays and menus.
  - b. Alarm indicator light and horn as well as an acknowledge (or "mute") button. The alarm light shall be active anytime there is an active alarm, and the alarm horn shall be active anytime there is an active, unacknowledged alarm. It shall be software selectable which individual alarm conditions, if any, that activate the horn.
  - c. Alarm history buffer displaying the 64 most recent alarms, including custom alarm text and time stamping of time of alarm occurrence and time when the alarm condition returned-to-normal.
  - d. User password protection for KPD editing access as well as separate technician password protection.
  - e. View and adjustment of operating schedules – normal, holiday, and override schedule modes.
  - f. Ability to connect or disconnect the KPD "on-the-fly" without the need to cycle power to the controller for the KPD to be fully functional.
  - g. Option to mount the KPD component itself up to 1,500 feet away from the unit.
  - h. Ability to reset the controller's time/date.
  - i. Ability to field-adjust through the KPD which protocol the controller communicates through its open protocol port as well as the ability to adjust certain protocol parameters (such as baud rate, stop bits, parity, protocol mode, etc.).
- M. DUCT SYSTEM: Unit shall have factory-installed internal duct system. Individual zone heads shall be sized and located for connection to the existing zone systems. The return air opening shall include a protective grate. Zone balance dampers shall be provided when required to allow aggregate balancing of each zone on the building roof. Sub-zone control dampers actuators shall be easily accessible through external access panels without removing any screws, bolts, etc.
- N. ELECTRICAL: 460 volt, three phase with main over current protection device and branch circuit breakers shall be provided in each unit. Condensing unit disconnect switches shall be mounted on the exterior of the penthouse adjacent to the respective condensing units. A main electrical disconnect switch shall be factory mounted on each unit. Unit shall include a factory-installed power quality monitor to disable unit during phase loss, high voltage or low voltage conditions.
- O. WARRANTIES: The unit shall include the following manufacturer's parts only warranties with no labor allowance unless noted:
  1. Heat exchangers shall have a ten-year limited warranty with 50 °F minimum inlet air.

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2. Solid-state ignition modules shall have a one-year limited warranty.
3. Blower motors shall have a limited one-year warranty.
4. The compressor shall have a limited five-year warranty.
5. All other covered components shall have a limited one-year warranty.

**P. EQUIPMENT MANUFACTURER REQUIREMENTS:**

1. Inspect existing equipment and site prior to construction.
2. Complete system design to match equipment with building requirements.
3. Provide customized submittal data matching job requirements.
4. Fabricate all equipment in accordance with job schedule.
5. Control equipment delivery to meet schedule requirements.
6. Provide a project manager to supervise the installation.
7. Start-up equipment with the assistance of the installing contractor.
8. Complete detailed training of system operation, maintenance and troubleshooting for the owner.
9. Provide Operating and Maintenance instructions, including color-coded unit wiring diagrams showing actual wiring colors.

**PART 3 - EXECUTION**

**3.1 INSPECTION**

- A. Examine areas and conditions under which multizone units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

**3.2 INSTALLATION OF MULTIZONE UNITS**

- A. Install multizone units where indicated, in accordance with equipment manufacturer's instructions with unsatisfactory conditions corrected.
- B. Factory mounted integral disconnect switches shall be provided for all units.

**3.3 TESTING**

- A. Upon completion of installation of multizone units, start up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.

**3.4 CLEANING UP**

- A. Upon completion of work, remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Furnish and install all necessary labor, materials, tools and equipment to perform and completely finish the work according to the intent of this specification, and the accompanying drawings.
- B. Furnish and install any incidental work which can reasonably be inferred as required and necessary to provide complete and workable systems.
- C. Provide connections of all equipment specified under these sections and other Divisions including Divisions 22 (Plumbing) and 23 (HVAC) including installation and connection of all motors, relays, remote starters, etc.
- D. The requirements of the General and Supplemental Conditions, and Division 01 apply to Divisions 26, 27 and 28, and these specifications. All sections in Divisions 26, 27, and 28 are interrelated. Work specified in other sections, as applicable, shall apply to all work hereunder.

**1.2 LOCAL CONDITIONS**

- A. Examine site; verify dimensions and locations against drawings and become informed of all conditions under which work is to be done before submitting proposal. No allowance will be made for extra expenses because of omission on Contractor's part to include cost of work under prevailing conditions.
- B. Information shown relative to services is based upon available records and data shall be regarded as approximate only. Minor deviations found necessary to conform with actual locations and conditions shall be made without extra cost.
- C. Extreme care shall be exercised in excavating near existing utilities to avoid any damage thereto. It shall be the contractor's responsibility to verify existing underground utilities prior to digging anywhere. Information provided on these plans indicating existing conditions shall only be used as reference, and shall not be deemed considered accurate. Any damage to existing utilities done by the contractor shall be repaired and/or replaced by the contractor at their expense to its pre-damage condition.

**1.3 PERMITS AND INSPECTIONS**

- A. Obtain and pay for all permits and service charges required in installation of the work. Arrange for required inspections and secure approvals from authorities having jurisdiction.
- B. During its progress, work shall be subject to inspection by Project Inspector.

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**1.4 CODES AND STANDARDS**

- A. Work and materials shall be in full accordance with California Occupational Safety Health Act (CAL-OSHA), California Electrical Code (CEC), State Fire Marshal, Electrical Safety Orders (Title 8, Subchapter 5), the National Fire Protection Association, California Building Code (CBC); California Code of Regulations - Title 24 and other applicable State or local laws or regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes.
- B. Electrical materials shall bear the label of, or be listed by, the Underwriter's Laboratories (UL) unless of a type for which label or listing service is not provided.
- C. Materials and components shall conform to Industry Standards, including:
  - 1. NEMA - National Electrical Manufacturer's Association
  - 2. ANSI - American National Standards Institute
  - 3. ASTM - American Society for Testing Material Association
  - 4. IPCEA - Insulated Power Cable Engineer's Association
  - 5. CBM - Certified Ballast Manufacturers
- D. When Contract Documents differ from governing codes, furnish and install larger size or higher standards called for without extra charge.

**1.5 REVIEW OF MATERIALS**

- A. Prior to commencement of Work and within 35 days after award of contract, submit for approval in accordance with General Conditions all equipment and materials to be furnished.
  - 1. Equipment/Product submittals shall be bound and indexed and shall include a table of contents listing all equipment submitted. The table of contents shall include: Project designation, submittal number, submittal name including specification section, date, and include manufacturer, model number, reference specification paragraph or sheet detail number, description, and page location. Where a group or series of products are submitted, each item does not have to be listed; only the series need to be identified. Example:

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Project:

Submittal No.

Submittal Name:

Date:

Spec para.,

Page(s)	Manufacturer	Model No.	Detail No.	Description
1-12	XYZ Corp	123ABC	2.5	Control panel
13,14	XYZ Corp	456DEF	2.6-A	Power supply
15	ABC Corp	789GHK	A/E9.5	Rack
16,17	Cantex	PVC-40	2.1	PVC conduit
18	Steel City	XYZ series	2.2	Steel fittings

2. Shop drawings submittals shall be neat and professionally done using CAD (computer aided drafting), hand-drawn submittals will not be accepted. Shop drawings shall have sufficient information to clearly indicate work to be performed and be complete including device/equipment locations, wire sizes, wire types and number of wires, symbol list or legend, point-to-point connections, wiring diagrams, and equipment anchorage detail where needed. Shop drawings shall utilize the same size paper as the Bid set of plans.

**B. Substitutions:**

1. Only one request for substitution will be considered on each item of material or equipment. No substitutions will be considered thereafter. Substitutions will be interpreted to be all manufacturers other than those specifically listed by model or catalog number. Should the original submittal of a proposed substitution be rejected, the specified item shall be furnished.
2. Submit complete information or catalog data to show equality of equipment or material offered to that specified. Identify which product is being substituted in the specifications and/or the plans and provide analysis as indicating either it "Complies" or that it "Does Not Comply" and providing a reason. Each Specification paragraph shall be provided with this analysis. No substitutions will be allowed unless requested and approved in writing. Materials of equal merit and appearance, in the opinion of the Engineer, will be approved for use. Engineer reserves the right to require originally specified item.
3. Acceptance of a substitute is not to be considered a release from the Specifications. Any deficiencies in an item, even though approved, shall be corrected by the Contractor at his expense.



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- 4. Responsibility for installation of approved substitution is included herein. Any changes required for installation of approved substituted equipment shall be made without additional cost to Owner.
- C. Where it is in the best interest of the Owner, Engineer may give written consent to a submittal received after expiration of designated time limits, or for an additional resubmittal.
- D. Submit for approval in ample time to avoid delay of construction, shop drawings or submittals on all items of equipment and materials covered in list mentioned above. Submit in accordance with General Conditions in a complete package; partial submittals will not be considered.
- E. Failure to comply with any of the preceding requirements will necessitate that the specified materials be submitted and supplied.

**1.6 RECORD DRAWINGS**

- A. Upon completion of Work, furnish Engineer with AutoCAD file, PDF file, and one printed full size hardcopy upon which shall be shown all Work installed under contract including any Work which are not in accordance with Original Contract Drawings. AutoCAD files shall be 2004 or later version, with external references bound to its parent drawing. Provide a separate PDF file for each sheet, do not combine all sheets into a single file. Furnish digital files on a USB flash drive or CD.
  - 1. The above shall also include shop drawings.
- B. All symbols and designations used in preparing Record Drawing shall match those used in Contract Drawings.
- C. Show all buried and concealed conduit, stub-outs, etc. Locate all buried conduit and stub-outs by dimensions from permanent, easily located and identifiable portions of structure; also, dimension ends of stub-outs, etc. Note depth of buried items below grade.

**1.7 ADDENDA AND CHANGE ORDERS**

- A. Changes in the plans and specifications shall be made by Addenda or Change Orders signed by the Engineer.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Materials mentioned herein or on drawings require that each item listed be provided and of quality noted, or an approved equal. All material shall be new, full weight and standard in all respects and in first-class conditions. Where possible, all materials used shall be of the same brand or manufacturer throughout for each class of material or equipment.

- B. Grade or quality of materials desired is indicated by trade names or catalog numbers stated herein. Dimensions, sizes and capacities shown are a minimum and shall not be changed without permission of Engineer.

### **PART 3 - EXECUTION**

#### **3.1 DRAWINGS AND COORDINATION**

- A. Examine Drawings and Site; be familiar with types of construction where electrical installation is involved. Work shall be neatly installed in a workmanlike manner in accordance with NECA Standard of Installation. Work shall be coordinated with other trades to avoid conflicts. Clarifications will be made by Engineer and minor adjustments shall be made without additional cost to Owner. Obtain ruling from Engineer concerning any obvious discrepancies or omissions in work before bidding. All work involved in correcting obvious errors or omissions after award of Contract shall be performed as directed by Engineer without additional cost to Owner.
- B. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial), but shall be followed as closely as possible. Drawings and Specifications are for assistance and guidance, and exact locations, distances, levels, etc., will be governed by Site.
- C. All equipment (devices, conduits, boxes, etc.) shall be flush or semi-flush mounted unless otherwise noted. Where conditions do not allow flush mounting and where acceptable to the Architect, equipment may be surface mounted.

#### **3.2 WORKING SPACE**

- A. Provide adequate working space around electrical equipment in compliance with Article 4 of Electrical Safety Orders. In general, provide 36 inches minimum clear work space in front of panelboards and controls of 120/208 volt systems and 42 inches minimum for 277/480 volt systems.

#### **3.3 CARE AND CLEANING**

- A. All broken, damaged or otherwise defective parts shall be repaired or replaced without additional cost to Owner. Work shall be left in a condition satisfactory to Engineer. At completion, carefully clean and adjust all equipment, fixtures and trim installed as part of this work. Systems and equipment shall be left in a satisfactory operating condition.
- B. All surplus materials and debris resulting from this work shall be cleaned out and removed from site; this includes surplus excavated material.

#### **3.4 EXCAVATING AND BACKFILLING**

- A. Excavate and backfill as required for installation of electrical work. Restore all surfaces, roadways, sod, walks, curbs, walls, existing underground installation, etc., cut by installations to original condition in an acceptable manner. Maintain all warning

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signs, barricades, flares and lanterns as required by the Safety Orders and local ordinances.

- B. Excavation: Dig trenches straight and true to line and grade, with bottom clear of any rock points. Minimum conduit depth of pipe crown shall be 24 inches below finished grade.
- C. Backfill: Support conduits with 2" sand bedding at bottom of trench. Provide sand backfill from bottom to 12" below finished grade. The top 12" to be local fine earth material free of rubble, rubbish or vegetation. Trenches shall be backfilled and compacted to 90% (per ASTM D1557) of maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

**3.5 PROTECTION**

- A. In performance of work, protect work from damage. Protect electrical equipment, stored and installed, from dust, water or other damage.

**3.6 EQUIPMENT IDENTIFICATION**

- A. Panelboards, remote control switches, terminal boxes, etc., shall be properly identified with a descriptive nameplate. Nameplate shall be made of 3/32 inch laminated plastic with black background and white letters. Size of letters shall be 1/4 inch high for equipment in device box or boxes 12" or smaller, and 1/2 inch high for panelboard, terminal can, or larger items. Letters shall be machine engraved. Punched strip type nameplates and cardholders in any form are not acceptable. Nameplates shall be attached with oval head machine screws tapped into front panel.
- B. Indicate type of equipment and equipment designation, ex. "PANEL-XXX", "MAIN SWITCHBOARD-XXX", "TRANSFORMER-XXX", "SIGNAL-XXX", "TV-XXX", "EF-1", "AC-1", etc.

**3.7 RUST INHIBITOR**

- A. Channels, joiners, hangers, straps, clamps, brackets, caps, nuts and bolts and associated parts shall be plated electrolytically with zinc followed immediately thereafter by treating freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of one hundred twenty (120) hours when subjected to a standard salt spray cabinet test, or shall be hot dipped galvanized.

**3.8 EQUIPMENT PADS**

- A. Concrete reinforced pads for mounting of equipment (i.e. switchboard, transformers, freestanding panels, etc.) shall be minimum 3000psi, 6" thick with #4 rebars at 12" on center each way. Rebars shall be centered in pad. Pad shall extend 2" beyond equipment and 1.5" above surrounding area. Backfill and compact to 95% maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

### **3.9 EQUIPMENT ANCHORAGE**

- A. Seismic Anchorage of Electrical equipment shall conform to the regulations of CBC-2019 and ASCE 7-16, Chapters 13 and 29. All equipment shall be braced or anchored to resist a horizontal force acting in any direction using the following criteria:
  - 1. The total design lateral seismic force shall be determined from section 1613A California Building Code (CBC) 2019 and 13.3 ASCE 7-16. Forces shall be applied in the horizontal directions, which results in the most critical loadings for design.
  - 2. The value of  $A_p$  (component amplification factor) and  $R_p$  (component response modification factor) of section 13.3.1 ASCE 7-16 shall be selected from section 13.6-1 ASCE 7-16. The value of  $I_p$  (seismic importance factor) shall be selected from 13.1.3 ASCE 7-16.
- B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the structural engineer and the District Engineer of the Division of The State Architect.

### **3.10 ARC FLASH**

- A. Electrical equipment such as switchboards, panelboards, load centers, motor control centers, industrial control panels, meter centers shall be field marked to warn persons of potential electric arc flash hazards per CEC 110.16 and NFPA 70E Standard for Electrical Safety in the Workplace. Minimum label wording shall be as follows:

DANGER

Arc Flash and Shock Hazard.

Appropriate PPE Required.

Do not operate controls or open doors without appropriate personal protection equipment.

Failure to comply may result in injury or death.

### **3.11 TEST**

- A. Test all wiring and connections for continuity and grounds; where such test indicate faulty insulation or other defects, locate, repair and retest. Balance loads at panelboards. Furnish all testing equipment.

### **3.12 CLOSING OF AN UNINSPECTED WORK**

- A. Do not allow or cause any of work installed hereunder to be covered up or enclosed before it has been inspected and approved.
- B. Should any work be enclosed or covered up before it has been approved, uncover such work and after it has been inspected and approved, make all repairs necessary to

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restore work of others to conditions in which it was found at time of cutting, all without additional cost to Owner.

**3.13 WARRANTY**

- A. All materials and installation shall be provided with a one (1) year warranty which shall include replacement parts, labor, retesting, and travel to and from the job site. The warranty period shall begin after final acceptance of the project. The warranty shall cover but is not limited to the following:
  - 1. Defective workmanship and installation.
  - 2. All System components, devices, conduit, wires, etc.
  - 3. Manufactured items such as light fixtures, receptacles, switchboard, panelboard, transformer, switches, etc.
  - 4. Basic materials such as conduit, wires, boxes, cabinets, etc.
- B. Certain manufactured items will have longer warranty periods. Refer to specific item and specification section for warranty information and terms.

**END OF SECTION**

**PART 1 - GENERAL****1.1 SCOPE**

- A. The work of this Section consists of basic materials and methods for all work included under Divisions 26, 27, and 28. Additional specifications requirements for electrical work are specified under other sections of Divisions 26, 27 and 28 and where those requirements differ from the requirements of this Section, they shall govern.

**1.2 SUBMITTALS**

- A. Submit product data per Section 26 0000.

**PART 2 - PRODUCTS****2.1 CONDUIT**

- A. Rigid Steel Conduit: Standard weight, mild steel pipe, zinc coated on both inside and outside by a hot dipping or sherardizing process. Inside and outside of conduit shall be finished with a protective coating. All threads galvanized after cutting. Meets UL 6, UL Card #DYIX, and ANSI C80.1.
- B. Intermediate Metallic Conduit (IMC): Intermediate weight, mild steel pipe, meeting same requirements for finish and material as rigid steel conduit. Meets UL 1242, UL Card #DYIX, and ANSI C80.6.
- C. Electrical Metallic Tubing (EMT): Cold rolled steel tubing, hot-dipped galvanized, with zinc coating on outside and protective lubricating coating on inside. Fittings shall meet same requirements for finish and material as EMT. Meets UL 797 and ANSI C80.3.
- D. Flexible Conduit: UL Listed. Flexible steel, zinc coated on both inside and outside by hot dipping or sherardizing process. Liquid-tight conduit shall be galvanized with extruded polyvinyl covering and with watertight connectors, sunlight resistant, direct burial rated. Flexible steel conduit less than 1/2" shall not be used except that 3/8" shall be permitted in lengths not in excess of 6 feet as part of a listed assembly or for tap connections to lighting fixtures as required in CEC Section 410-67(c). Flexible conduit to be one continuous length, no couplings. AFC Liquid-Tuff Type-LFMC and AFC Reduced Wall Flexible Steel Conduit, or equal.
- E. Raceway Fittings:
  - 1. Rigid Steel Conduit: Fittings, such as couplings, connectors, condulets, elbows, bends, etc., shall be subject to same requirements as for rigid steel conduit. Couplings and unions shall be threaded type, assembled with anti-corrosion, conductive anti-seize compound at joints made absolutely tight to exclude water. Connectors shall be threaded hubs with bonding insulated metallic bushings. Unions shall be equal to Crouse Hinds UNY or UNF.
  - 2. IMC: Fittings shall be as specified for rigid steel conduit.
  - 3. EMT: Fittings shall be steel, box connectors shall have insulated throat. Connectors and couplings to be compression type.

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4. Flexible Metallic Conduit: Connectors to be insulated. Metallic connectors (except for liquid-tight) shall be steel "squeeze" type via a screw, Steel City XC-90X and XC-49X series. Liquid-tight metallic connectors shall be watertight approved for such use.
  5. Bushings: Metallic insulated type. Weatherproof or dust-tight installations; liquid-tight with sealing ring and insulated throat, OZ/Gedney type "KR".
  6. Expansion and Deflection Fittings: OZ/Gedney, Type "DX" or accepted equal.
  7. All box connectors to be insulated throat type.
  8. Conduit Straps: Galvanized steel, 2-hole straps. 1-hole straps may be used for conduit sizes 1" and smaller concealed in wall or above ceiling.
- F. Metallic conduits, raceways, and fittings shall be listed and approved as a grounding means.

## **2.2 BOXES**

- A. Galvanized one-piece or welded pressed steel type. Boxes for fixture shall not be less than 4" square and shall be equipped with fixture stud. Boxes shall be at least 1-1/2" deep, 4" square for 1 or 2 gang devices, with plaster rings and gang box with gang cover. Boxes mounted in wall or ceiling finished with gypsum board shall be furnished with 3/4" deep plaster rings. Use screws and not nails to support/secure outlet boxes. Provide blank cover plates for all boxes without devices.
1. 1-gang and 2-gang outlet and junction boxes installed exposed outdoors shall be weatherproof type FS, FD, WS, WD die cast metal or aluminum boxes, Appleton or equal. Plug all unused hubs.
  2. Provide an equipment grounding pigtail at all receptacle, switch, and device outlet boxes. Ground conductor size to match circuit overcurrent protection complying with CEC.
  3. Outlet boxes for data, telecommunications, video, and TV outlets shall be 4 11/16" square x 2.125" deep.
  4. Outlet boxes containing #8, #6, or #4 AWG wires shall be a minimum 2.125" deep per CEC.
- B. Junction boxes located outdoors, or in wet or damp locations shall be rated NEMA-3R, with hinged door and pad-locking tabs.
- C. Equipment furnished by other trade but require electrical connection shall be provided with appropriate backbox.

## **2.3 WIRES**

- A. Wire shall be copper only, manufactured by General Cable Co., Rome, General Electric Co., or Anaconda. Wire shall be rated 90 degrees C for both dry and wet locations, THWN-2, XHHW-2, or RHW-2 insulation. 90 degrees C THHN may be used in dry and damp locations. Wire installed in high temperature areas, including branch circuits in or above roof insulation or in fluorescent ballast channel, shall have type RHW-2 or XHHW-2 90° insulation.

1. Feeders sized #2 and larger routed below grade, extending beyond or outside the building foundation line shall use types XHHW-2, THW-2, or RHW-2 insulation, 90 degrees C dry and wet rated.
- B. Wire shall be Code type copper wire of not less than 98% conductivity. Wires #8 gauge and larger, shall be stranded. Wires shall bear the Underwriters' label, be color coded and be marked with gauge, type and manufacturer's name on 24" centers. Wires smaller than #8 may be solid or stranded. Where stranded wire is used, provide solid pigtail for connection to screw terminals of receptacles, switches, etc.
- C. Color Coding to be as follows:

	208/120 Volts	480/277 Volts
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Grey
Ground	Green	Green

1. Switch legs shall use the same branch circuit phase color coding which they are connected to. IG ground wire shall be green with yellow tracer.
- D. Bring wire to job in original unbroken packages. Obtain approval of inspector or Engineer before installation of wires.

## 2.4 CONVENIENCE OUTLETS

- A. Shall be "Specification" grade rated 15 amperes at 125 volts, duplex, composition base with slots to accommodate parallel plug caps with grounding peg. Contact shall grip both sides of plug prongs. Where only one receptacle is connected to a 20 ampere circuit, a 20 ampere receptacle shall be used. Outlet shall be UL listed. Receptacles to be Hubbell or equal.
  1. 15 Amp: Hubbell 5262 series Heavy Duty Industrial Grade, 8200 series for Hospital Grade.
  2. 20 Amp: Hubbell 5362 series Heavy Duty Industrial Grade, 8300 series for Hospital Grade.
  3. Other designations as noted below:
    - a. Ground Fault: GFR
    - b. Tamper Resistant: TR
    - c. Weather Resistant: WR
    - d. Isolated Ground: IG
  4. Leviton 5252, 5352, 8200, and 8300 series can be considered equal.
  5. Pass & Seymour 5252, 5352, 8200, 8300 series can be considered equal.



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- B. Provide devices with matching plates. Isolated ground (IG) receptacles shall be orange with matching color plate. Hospital grade receptacles shall have a distinctive "green" dot. GFI receptacles shall have a visible (light) indicator.
- C. All 15 and 20 Amp, 125V and 250V non-locking receptacles (NEMA 5-15, 5-20, 6-15, 6-20) located outdoors and/or in damp or wet locations shall be listed weather-resistant type. Weather resistant receptacles shall be the same grade or class as 15A and 20A receptacles specified above.
- D. Weatherproof covers for receptacles in wet locations shall be rated as weatherproof whether or not a plug is inserted (NEMA-3R), minimum 3.25" clearance from front of receptacle, metallic cast type with hinged lid and padlocking hasp, Leviton or equal. Weatherproof covers for receptacles in damp locations shall be rated as weatherproof when attachment plug is removed, with metallic cast cover and flip lids with padlocking hasp.
- E. Provide a separate GFI duplex receptacle at each location identified on the drawings and as specified. Through wiring is not acceptable. Receptacles located at the following locations shall be GFI type, whether indicated in the plans or not.
  - 1. In elevator control rooms.
  - 2. In elevator pits/shafts.
  - 3. In bathrooms or restrooms.
  - 4. Outdoors, on the exterior of the building, and on/above the roof.
  - 5. In commercial and institutional kitchens, unless dedicated to specific equipment.
  - 6. Within 72" from any sink or basin such as in a small kitchen, lunch/break room, and the like.
- F. Provide an equipment grounding jumper (pigtail) connecting the grounding terminal of the receptacle to the grounded box.

## **2.5 SAFETY/DISCONNECT SWITCHES**

- A. Type "HD" Heavy Duty safety switches with externally operated handle. Switches shall be manufactured by Westinghouse, General Electric, Square D, or approved equal. Switches shall be rated 250 and 600 volts, A.C., of size and poles as shown on Drawings and as required. Disconnects used outdoor shall be in NEMA-3R. Provide fused switches with proper sized fuses where required by equipment manufacturer. All switches shall have pad-locking cover with interlocking cover. Switches shall be capable of be pad-lockable in the ON or OFF position. Label switch with circuit identification per section 26 0000, example "AC-1, HD1-24".

## **2.6 INDIVIDUAL CIRCUIT BREAKERS**

- A. Circuit breakers shall be molded case thermal magnetic type with trip rating as scheduled on drawings.
  - 1. Circuit breaker trip settings 300 amps and higher shall have Long-Time setting, STPU, STD, GFPU, Inst. PU settings. Breaker shall be solid state with field adjustable and replaceable trip rating plugs, or of the electronic type.

2. Circuit breakers with trip settings 1200 amps and higher shall be solid state electronic type with full function trip units including: LTPU, LTD, STPU, STD, Inst PU, Inst OFF, GFPU, GFD.
- B. Circuit breakers shall be quick-make, quick-break, trip free operation. The trip-free mechanism shall be independent of manual handle control. All circuit breakers shall be fully rated to withstand the available short circuit current as designated on the drawings. Series rated equipment will not be acceptable.
- C. Breakers to be in NEMA-1 (indoor) or NEMA-3R (damp, wet, and outdoor) enclosures. NEMA-3R enclosures shall have the handle concealed behind the cover, and the hinged cover shall be provided with padlocking tabs. Each circuit breaker shall be identified with an engraved, laminated phenolic plate showing the load served or the function of the circuit breaker and trip rating. The nameplate shall be attached with oval head machine screws tapped into the front of the board. Equip breaker handles with padlocking "lock-off" devices.

## **2.7 PULL LINE**

- A. Furnish and install pull line in all unused (empty) raceways. Pull lines shall not rot or mildew.
  1. Conduits up to 1.5": 1/8" diameter braided line of polypropylene with 200 lbs. tensile strength, IDEAL, Jet-Line #232, or equal.
  2. Conduits 2" or Larger: 3/16" polypropylene pull rope with 800 lbs. tensile strength, IDEAL Pro-Pull or equal.
- B. Provide pull line in conduits for utility company systems, size and type per their requirements.

## **2.8 ACCESS DOORS**

- A. Milcor, Newman or equal with concealed hinges, screwdriver locks, prime coated with rust inhibitive paint, and style of door to suit ceiling or wall construction, including fire rating. Access doors in acoustical tile ceilings shall be Hi-Hatch with tile recess. Doors shall be 14 gage C.R. steel and shall be 22" x 30"; 24" x 24" in tile ceilings, unless otherwise noted or required.

## **2.9 SURFACE METALLIC AND NONMETALLIC RACEWAYS**

- A. The surface raceway system for branch circuit wiring and/or data network, voice, video and other low-voltage wiring shall be manufactured by the Wiremold Company, or equal. Raceway series as indicated on the plans. The raceway and all system components must be UL listed and exhibit non-flammable self-extinguishing characteristics. The raceway shall be a two-piece design with a base and a snap-on cover.
  1. The nonmetallic raceway base and cover shall be manufactured of rigid PVC compound, available in ivory color. Exposed cuts shall be covered with cover clips.
  2. The metal raceway base and cover shall be manufactured of galvanized steel, ivory finish and suitable for field painting.

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- B. A full complement of fittings must be available including, but not limited to flat, internal and external elbows, tees, entrance fittings, boxes, covers, adapters, cover clips, and end caps. The fittings shall match the base and cover, and be of matching colors. All fittings shall be supplied with a base where applicable to eliminate mitering. A transition fitting shall be available to adapt to other Wiremold series raceways. Field cuts shall be clean, straight, and true with no rough edges.
- C. For multicompartment raceways, device brackets shall be available for mounting standard devices in-line or offset from the raceway. A device bracket shall be available for mounting up to four devices at one location. Faceplates shall match and fit flush in the device plate and shall overlay the cover and base to hide uneven cuts. They shall match the raceway base and cover. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP (i.e. data jacks), STP (150 ohm), Fiber Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting.
- D. Work shall include furnishing all raceway and appropriate fittings and device plates to install a nonmetallic surface raceway system. Installer shall comply with detailed manufacturer's instruction sheets, which accompany system components as well as system instruction sheets.
- E. Non-metallic raceway systems shall not be used in Assembly areas and other areas where the system is not rated for the installation. Assembly areas include but not limited to; gymnasiums, multipurpose rooms, auditoriums, conference rooms, etc.

#### **2.10 COVER PLATES**

- A. Switch and receptacle cover plates shall be smooth nylon type. Cover plates for other devices/outlets such as data, telephone, television, etc. shall be nylon. Cover plate color shall be ivory, matching all systems.
- B. For multi-purpose rooms, gymnasiums, kitchens, locker rooms, toilet/restrooms, and walls such as CMU, brick, concrete block, and concrete walls, device plates shall be smooth stainless steel with beveled edges.
- C. Each receptacle shall have its circuit identification on the cover plate (i.e., "LA1-12"). Use typewritten "clear tape". Use black letters/numbers for light colored (white, almond, tan, beige, etc.) cover plates. For darker colored cover plates (black, brown, gray, red, etc.), tape to be white with black letters/numbers. Tape shall be located at the lower portion of the cover plate. Clean surface before adhesive tape is applied, and wrap tape (approx. 1") at each end around back side of each cover plate.
  - 1. For floor boxes, plates shall be engraved with circuit identification.
  - 2. For light switches, use same circuit identification method as for receptacles.

## **PART 3 - EXECUTION**

### **3.1 CONDUITS & CIRCUITS**

- A. All conduits shall be rigid steel or IMC except EMT may be used at following locations:
  - 1. In dry locations in concealed furred spaces.

2. In partitions other than concrete, concrete block, or solid masonry.
  3. For exposed work indoors and outdoors above 10 ft except:
    - a. In special locations prohibited by Code, such as hazardous locations, rigid steel shall be used.
    - b. Conduits exposed on/above the roof shall be rigid steel up to 10 ft above roof surface.
    - c. Conduits exposed in Gymnasiums and Multi-Purpose Rooms shall be rigid steel up to 25 ft.
  4. Concealed above suspended ceilings or ceilings directly attached to structure above.
- B. Flexible Conduit: Shall be used to provide flexible connections of short length (3 ft or less) to equipment subject to vibration or movement and to all motors. Up to 6 ft is allowed where additional flexibility is needed. Provide a separate bonding conductor in all flexible connections/conduit. Flexible conduit shall be one continuous length without couplings.
1. Secure flex conduit within 12" of each box, cabinet, conduit body, or other termination, and maximum 4.5 ft on center. Refer to the CEC for other secure lengths where flexibility is required or in other specific instances.
- C. Run conduit concealed in areas having finished ceilings and in walls. Run all cross conduits and vertical risers or drops concealed in wall and/or partitions. Should it be necessary to notch any framing members, make such notching only at locations and in a manner as approved by the Architects. Where concealing conduit is not possible or practical, conduit may be run exposed in areas only where so permitted by the Architect. Install exposed conduit run neatly, parallel to or at right angles to structural members. Maintain a minimum of 6" clearance from steam or hot water pipes.
- D. Support conduit with straps and secure to wood structure by means of bolts or lag screws, to concrete by means of insert or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry by means of toggle bolts. Expanders and shields shall be steel or malleable iron.
- E. Do not install in concrete slabs.
- F. Support individual conduits with 2-hole steel straps. 1-hole steel straps may be used for conduits 1" and smaller concealed in wall or above ceilings.
- G. Galvanized iron hanger rods sizes 1/4" diameter and larger with spring steel fasteners, clips or clamps specifically designed for purpose for conduits up to 1" size may be used.
- H. Individual conduits 3/4" and smaller run above wire suspended ceilings may be supported from independent hanger wires with approved spring steel clips. Wire ties will not be acceptable. Wire shall be taut and secured to ceiling and structure above.
- I. Support multi-parallel horizontal conduit runs with trapeze type hangers consisting of two or more steel hanger rods, cross channels, J-bolts, clamps, etc.
- J. Sizes of rods and cross channels shall be designed to support four times actual load. Hanger rods shall have safety factor of 5 based on ultimate strength of material used.

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- K. Conduits for data, telecommunications, signal, video, TV, and/or containing fiber optic, coaxial, or OSP (outside plant) multi-pair cables shall have a minimum inside bend radius per CEC Table 346-10 (do not use exception); except that conduits 2" to 4" shall be minimum 24" radius bends.
- L. After installation of conductors, all conduits routed below grade shall be sealed at each opening, including risers and in pull boxes, to prevent the entrance of water and debris.
- M. Conduits not terminated into a box or cabinet, such as stubbed to a backboard, shall be terminated with an insulated bushing. Bushings for metallic conduits shall be metallic type secured by set screw, compression, or threaded type. Bushings for PVC conduits shall be glued in place.
- N. Although circuiting is shown as diagrammatic, their point-to-point destinations and their indication of above/below ground route shall be followed as much as possible. Where site conditions dictate that an alternate means of routing will alleviate conflicts, the alternate means will be considered with prior approval by the Engineer.
- O. Where cinder fill is encountered in Block walls, conduit shall be PVC-40 where in contact with cinder fill. Boxes shall be PVC type where in contact with cinder fill.
- P. EMT conduit circuits installed on the roof, if allowed by the Engineer, shall have a ground conductor routed with the circuit conductors sized per the circuit protective device.
- Q. Horizontal runs of conduit above suspended wire lay-in ceilings shall not be less than 12" above the ceiling.
- R. Maintain 12 inch separation between power circuits (>120V) and all signal circuits (data, telephone, speaker, clock, etc.) to prevent interference.
- S. Feeder conduits connected to panels/switchboard shall have ground lug bushing connected to equipment ground buss with ground wire same size as largest ground wire in the panel/switchboard.
- T. Conduits penetrating through the roof shall be secured within 12" below roof and supported within 12" of the penetration on the roof.
- U. Where conduits cross building expansion/seismic joints provide a short length of flexible conduit (do not exceed 6 ft.) and fittings listed as a grounding means, or in locations where flex conduit cannot be used provide UL listed expansion/seismic fittings.
- V. Conduits concealed in any masonry shall be routed in a conduit sleeve. Such sleeves shall not be placed closer than 3 diameters, center to center.
- W. Conduits to air conditioning (AC) equipment, fans, or other roof mounted equipment shall rise up from the ceiling below through the equipment curb or conduit window within the equipment, if allowed by equipment manufacturer, to prevent additional roof penetrations.

- X. Where conduit passes through finished walls or ceilings, provide steel escutcheon plates, chrome or painted as directed. Conduit which penetrate floor slabs, concrete or masonry walls shall be grouted and sealed watertight at penetrations.
- Y. For 20-amp 120 or 277 Volt Circuits using 90-deg C Wires:
  - 1. Do not install more than three(3) circuits in any conduit.
  - 2. Do not install more than six(6) current carrying conductors in any conduit.
  - 3. Where using #10 AWG wires to allow for conductor derating:
    - a. Do not install more than six(6) circuits in any conduit.
    - b. Do not install more than twelve(12) current carrying conductors in any conduit.
- Z. Cables and Raceways installed under metal-corrugated sheet roof decking shall maintain a minimum 1.5" from the nearest surface of the roof decking per CEC. This shall not apply to RMC or IMC.
- AA. Where switches control lighting loads supplied by a grounded branch circuit, the grounded conductor for the controlled lighting circuit shall be provided at the switch location. The grounded circuit conductor can be omitted where exceptions 1 & 2 apply. (CEC 404.2(C))

### **3.2 CAPPING**

- A. Cap conduits during construction with manufactured seals. Swab out conduits before wires are pulled in.
- B. Cap all empty conduits below grade and in pull boxes with manufacturer's caps to prevent entrance of water and debris, attach pull string to cap.

### **3.3 FLASHING**

- A. Make conduit projecting through roof watertight by proper flashing. Secure a sheet lead cap with a tightening bend to conduit. Use two collars for tar or asphalt composition roofings. Set one collar directly on roof deck and second collar set over on top of roofing felts. Lead sheet flashing shall be made of 4 lb. sheet lead. Use Stoneman #1100-4 series for individual conduits and #910/915 multi-flash for more than on conduit penetration, or equal.

### **3.4 PENETRATIONS OF FIRE RESISTIVE WALLS AND PARTITIONS**

- A. Penetrations of protected openings (fire rated walls, ceilings, floor-ceilings, roofs, etc.) shall be protected in accordance with the California Building Code, Part 2, Chapter 7, Title 24. Penetrations shall apply to conduits (raceways), cable trays, boxes, cabinets, panels, cables, etc.
- B. Fire stopping shall be provided at penetrations of fire resistive walls, floors, ceilings, floor-ceiling assemblies, and roofs. Fire-stopping shall have a "F" and/or "T" rating as determined by tests conducted in accordance with ASTM E 814 or UL-1479. Fire stopping system/materials shall be UL Listed.

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#### **3.5 ACCESS DOORS**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of electrical systems; for example, inaccessible areas and attics containing heat detectors, junction boxes, etc. Access doors shall provide for complete removal and replacement of equipment. Provide fire rated access doors where located in fire rated partitions.

#### **3.6 BOXES**

- A. Nails shall not be used to support outlet boxes. Boxes must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy-duty box hangers. For metal stud construction, use metal box hangers only. Box hangers shall be securely tied or welded (where permitted) or screwed to metal studs. Paint weld with rust inhibitor. Boxes installed in masonry tile or concrete block construction shall be secured with auxiliary plates, bars or clips and be grouted in place.
  - 1. Outlet Boxes with Receptacles or Switches: Provide a solid pigtail (green) ground wire grounded to the metallic outlet box. Pigtail shall also ground device and separate ground conductor if available. Size of ground wire to match overcurrent protection.
- B. Locate outlets at the following heights above floor to the center of the device or handle unless otherwise noted on Drawings or in Specifications.
  - 1. The top of the outlet box shall not be higher than 48" above finished floor, and the bottom of the outlet box shall not be less than 15" above finished floor. For forward or side approach over counter, maximum 44" and 46" respectively to top of box.
  - 2. Convenience Outlets: 18" (4" above counter or splash).
  - 3. Local Switches: 45".
  - 4. Telephone Outlets: 18" (45" for wall phone).
  - 5. Data, TV Outlets: 18".
  - 6. Where devices are shown at counter locations, they shall be located approximately 4" above counter, clearing back-splash where applicable.
  - 7. Refer to elevations and details on Architectural Drawings for exact heights and locations of all electrical outlets for switches, receptacles, special equipment, etc. Where above heights do not suit building construction or finish, consult Architect.
- C. Install pull boxes or junction boxes as required in accessible spaces but do not install in finished areas unless approved by Architect.
- D. Where fire rated construction is required (refer to Architectural Drawings), do not locate electrical outlet boxes back-to-back. Provide a minimum of 24" horizontal separation between outlet boxes on opposite side of the same wall. Where such restrictions cannot be met, provide fire-stopping around box such as 3M Moldable Putty Pads or equal.

- E. Boxes up to 100 cubic inches located in suspended wire ceilings may be supported through an independent hanger wire with approved tension clips. Wire shall be taut. Secure wire to the structure above and the ceiling below.

### **3.7 CONDUCTORS**

- A. Splices and joints for #10 AWG or smaller wiring shall be twisted together electrically and mechanically strong and insulated with approved type insulated electrical spring connectors, Scotchlok or Ideal. Joints and connections for #8 AWG or larger shall be made with Burndy, T & B, or approved equal, solderless tool applied pressure lugs and connectors. Uninsulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and with all irregular surfaces properly padded with "Scotchfil" putty prior to application of tape. Tape shall be equal to Scotch #33, General Electric #AW-1, or approved equal. Feeder splicing is not permitted.
  - 1. In special instances where feeder splicing is allowed by the Engineer, it shall be made with high compression sleeve type connector followed by manufactured splicing kit utilizing as insulators, resins poured into a ready-to-use plastic mold to provide a uniform, moisture-proof tough, impact-resistant insulation.
  - 2. Conductor splices below grade shall meet ANSI C119.1-1986 and UL 486D Standards. Raychem WCSM or FCSM heavy wall heat shrink tubing; or RVS or RVC series if use of flame heat is prohibited. Conductors to be joined with compression sleeve connectors.
- B. Use only UL approved wire pulling compound as lubricant.
- C. Lace conductors together with waxed linen lacing cord, T & B "Ty-Rap", Holub "Quik-Wrap" or equal, in a neat and workmanlike manner in panelboards, wireways, raceways, pull boxes and similar locations.
- D. #12 AWG wire shall be minimum size wire used for lighting and power circuits. Motor control circuits may be #14 except as marked on Drawings, unless shown.
- E. Provide cable supports in risers by means of a clamping device with insulated wedges or "Kellem" grips.
- F. All conductors shall be in conduit unless otherwise indicated.
- G. Conduit sizes shall be based on code fill table for THW insulated wires to accommodate the number, size, and type of wires shown or specified.
- H. Wiring installed in pull boxes or junction boxes, where wire is pulled through without terminations (except splices), shall have a service loop around the interior of the box for 360 degrees utilizing the largest circumference.
- I. Use #10 AWG conductor for 20 Amp 120 Volt circuit home runs longer than 75 feet, and for 20 Amp 277 Volt circuit homeruns longer than 200 feet.
- J. Where conductors are increased in size and number (such as for voltage drop reasons), such that conductors will not fit the standard breaker or panel lugs, terminate conductors in one of the following means:
  - 1. Provide larger breaker frame or panelboard.



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2. Provide oversized lugs.
3. Last Option only with Approval from Engineer: Terminate wires in multiport connector and provide pigtail. Splice to be made in panel or switchboard if space is available, or in separate splice box. This option will not be normally granted.

### **3.8 PANELS AND CABINETS**

- A. Recessed enclosures (panelboards, terminal cabinets, cabinets, control cabinets, etc.) shall be provided with a minimum of three 3/4" empty conduits stubbed into accessible space above the ceiling. Drawings may require additional conduits.

### **3.9 GROUNDING**

- A. Grounding and ground bonding of the electrical installation shall be in accordance with CEC Article 250, and any applicable codes. Ground fittings shall be approved manufactured type, installed and connected to conform with Code requirements.
- B. Neutral conductors and noncurrent-carrying parts of equipment at each installation shall be grounded in accordance with applicable code. Ground conductor shall be copper having a current capacity sized in accordance with CEC.
- C. All equipment cases, motor frames, etc., shall be completely grounded to satisfy requirements of CEC. Install bond wire in flexible conduit. Install copper bond wire, sized in accordance with CEC, in all nonmetallic raceways and bond to all metallic parts using approved fittings.
- D. Service ground conductor shall be connected to a "Ufer" encased ground and bonded to the metallic cold water pipe system and to the metallic natural gas line.
- E. Interior metallic cold water pipe system and other interior metallic piping systems shall be ground bonded to the building grounding system.
- F. Each building shall be provided with a grounding electrode connected to the metallic enclosure of the building disconnecting means. Grounding electrode conductor shall be sized per CEC table 250-66.
- G. Total ground resistance shall not exceed 25 ohms.
- H. All connections shall be made with solderless connectors or molded fusion-welding process.
- I. Equipment grounding conductors shall be insulated with a continuous green outer finish along its entire length. Conductors size #4 AWG and larger may be identified (with green electrical tape applied half-lapped) at each end and at every point where the conductor is accessible. Tape shall be applied from its point of entry to point of exit or termination.
- J. Insulated grounded (neutral) conductors shall be identified with a continuous white outer finish along its entire length. Neutral conductors #4 AWG or larger can be identified by a distinctive white marking (applied half-lapped with white electrical tape) for the last 12 inches at each end.

**3.10 FIELD TESTS**

- A. General: Perform field test in the presence of the Owner's Representative except as otherwise specified. Provide required labor, materials, equipment and connections to perform tests. Document results and submit them to the Owner's Representative. Repair or replace all defective work.

**3.11 GROUND FAULT PROTECTION AND TESTING**

- A. Where indicated on the plans, provide circuit breaker with ground fault protection. The ground fault system shall include a memory circuit for positive tripping action despite intermittent arcing ground faults.
- B. Provide an integral means of testing the ground fault system to meet the on-site requirements of CEC Articles 230 and 517.
- C. Provide acceptance testing per InterNational Electrical Testing Association Inc. (NETA) specifications and standards. Submit test results.

**3.12 CLEANING**

- A. Brush and clean work prior to concealing, painting and acceptance. Performed in stages if directed.
- B. Clean and repair soiled or damaged painted exposed work and match adjoining work before final acceptance.
- C. Remove debris from inside and outside of material, equipment and structures.

**3.13 WARRANTY**

- A. All materials and installation shall be provided with a one (1) year warranty which shall include replacement parts, labor, retesting, and travel to and from the job site. The warranty period shall begin after final acceptance of the project.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes electrical connections to equipment.
- B. Related Sections:
  - 1. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cable.
  - 2. Section 26 0533 - Raceway and Boxes for Electrical Systems.

### **1.2 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

### **1.3 SUBMITTALS**

- A. Section 01 3300 - Submittal Procedures.
- B. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's installation instructions.

### **1.4 CLOSEOUT SUBMITTALS**

- A. 017700 - Closeout Procedures.

### **1.5 COORDINATION**

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

## **PART 2 - PRODUCTS**

### **2.1 CORD AND PLUGS**

- A. Manufacturers:
  - 1. Leviton.
  - 2. Arrow Hart.

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- 3. Pass & Seymour.
- 4. Eagle.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet furnished for equipment.
- D. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify equipment is ready for electrical connection, for wiring, and to be energized.

### **3.2 EXISTING WORK**

- A. Remove exposed abandoned equipment wiring connections, including abandoned connections above accessible ceiling finishes.
- B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.
- C. Extend existing equipment connections using materials and methods compatible with existing electrical installations.

### **3.3 INSTALLATION**

- A. Make electrical connections.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install receptacle outlet to accommodate connection with attachment plug.
- E. Install cord and cap for field-supplied attachment plug.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

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- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**3.4 ADJUSTING**

- A. Section 01 7300 and 01 7700 - Execution and Closeout Procedures.
- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 DESCRIPTION**

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

### **1.2 MINIMUM REQUIREMENTS**

- A. The latest California Building Code (CBC), Underwriters Laboratories, Inc. (UL), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

### **1.3 TEST STANDARDS**

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
  - 1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing

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states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.

2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified: Materials and equipment which:
  - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
  - b. Are periodically inspected by a NRTL.
  - c. Bear a label, tag, or other record of certification.
4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

**1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)**

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
  1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
  2. The District reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

**1.5 APPLICABLE PUBLICATIONS**

- A. Applicable publications listed in all Sections of Division 26 shall be the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

**1.6 MANUFACTURED PRODUCTS**

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.

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- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
  - 1. Components of an assembled unit need not be products of the same manufacturer.
  - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  - 3. Components shall be compatible with each other and with the total assembly for the intended service.
  - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer. In addition, the following requirements shall be complied with:
  - 1. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to EOR fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
  - 2. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer. The Contractor shall be liable for all additional expenses for the EOR to witness factory re-testing.

**1.7 MATERIALS AND EQUIPMENT PROTECTION**

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
  - 1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
  - 2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
  - 3. Damaged equipment shall be repaired or replaced, as determined by the IOR.
  - 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
  - 5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

**1.8 WORK PERFORMANCE**

- A. All electrical work shall comply with requirements of the latest NFPA 70 (NEC and CEC), NFPA 70B, NFPA 70E, NFPA 99, NFPA 110, OSHA Part 1910 subpart J – General Environmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.



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- B. Job site safety and worker safety is the responsibility of the Contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. However, energized electrical work may be performed only for the non-destructive and non-invasive diagnostic testing(s), or when scheduled outage poses an imminent hazard to patient care, safety, or physical security. In such case, all aspects of energized electrical work, such as the availability of appropriate/correct personal protective equipment (PPE) and the use of PPE, shall comply with the latest NFPA 70E, as well as the following requirements:
  - 1. Only Qualified Person(s) shall perform energized electrical work. Supervisor of Qualified Person(s) shall witness the work of its entirety to ensure compliance with safety requirements and approved work plan.
  - 2. At least two weeks before initiating any energized electrical work, the Contractor and the Qualified Person(s) who is designated to perform the work shall visually inspect, verify and confirm that the work area and electrical equipment can safely accommodate the work involved.
  - 3. At least two weeks before initiating any energized electrical work, the Contractor shall develop and submit a job specific work plan, and energized electrical work request to EOR and IOR. At the minimum, the work plan must include relevant information such as proposed work schedule, area of work, description of work, name(s) of Supervisor and Qualified Person(s) performing the work, equipment to be used, procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
  - 4. Energized electrical work shall begin only after the Contractor has obtained written approval of the work plan, and the energized electrical work request from IOR and utility inspector. The Contractor shall make these approved documents present and available at the time and place of energized electrical work.
  - 5. Energized electrical work shall begin only after the Contractor has invited and received acknowledgment from IOR and utility inspector to witness the work.
- D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article WORK SEQUENCE under Section 01 1100, SUMMARY OF SCOPE.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 7329, CUTTING AND PATCHING.
- F. Coordinate location of equipment and conduit with other trades to minimize interference.

**1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the CEC.
- C. Inaccessible Equipment:

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1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
  2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

**1.10 EQUIPMENT IDENTIFICATION**

- A. In addition to the requirements of the CEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:
1. Nominal system voltage.
  2. Equipment/bus name, date prepared, and manufacturer name and address.
  3. Arc flash boundary.
  4. Available arc flash incident energy and the corresponding working distance.
  5. Minimum arc rating of clothing.
  6. Site-specific level of PPE.

**1.11 SUBMITTALS**

- A. Submit to EOR in accordance with Section 01 3300, SUBMITTAL PROCEDURES.
- B. The EOR's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.

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- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the EOR to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals per spec section 01 3300.
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
  - 2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
  - 3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
  - 1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
  - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
  - 3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
  - 4. The manuals shall include:

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- a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
  - b. A control sequence describing start-up, operation, and shutdown.
  - c. Description of the function of each principal item of equipment.
  - d. Installation instructions.
  - e. Safety precautions for operation and maintenance.
  - f. Diagrams and illustrations.
  - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
  - h. Performance data.
  - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
  - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.
- H. After approval and prior to installation, furnish the //Resident Engineer// //COR// with one sample of each of the following:
- 1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
  - 2. Each type of conduit coupling, bushing, and termination fitting.
  - 3. Conduit hangers, clamps, and supports.
  - 4. Duct sealing compound.
  - 5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

**1.12 SINGULAR NUMBER**

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

**1.13 ACCEPTANCE CHECKS AND TESTS**

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all

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components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the District.

- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests for the equipment. Repair, replacement, and re-testing shall be accomplished at no additional cost to the District.

**1.14 WARRANTY**

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the District.

**1.15 INSTRUCTION**

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the District at least 30 days prior to the planned training.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

### **1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Field quality-control test reports.

### **1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### **2.2 CONDUCTORS AND CABLES**

- A. Manufacturers:
  - 1. American Insulated Wire Corp.; a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THW, THHN-THWN2 or XHHW2 complying with NEMA WC 5 or 7.

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- E. Multiconductor Cable: Metal-clad cable, Type MC with ground wire. MC shall not be used unless approved prior to installation by the school district.

**2.3 CONNECTORS AND SPLICES**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. AMP Incorporated/Tyco International.
  - 3. Hubbell/Anderson.
  - 4. O-Z/Gedney; EGS Electrical Group LLC.
  - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**PART 3 - EXECUTION**

**3.1 CONDUCTOR AND INSULATION APPLICATIONS**

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN 2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC shall not be used without notice of approval from the school district.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

**3.2 INSTALLATION**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

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- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 0500 "Common Work Results for Electrical."
- F. Identify and color-code conductors and cables according to Section 26 0500 "Common Work Results for Electrical."
- G. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- H. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

**3.3 FIELD QUALITY CONTROL**

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**END OF SECTION**



**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

**1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For ground rods.
  - 1. Field quality-control test reports.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**1.4 GROUNDING ELECTRODE SYSTEM**

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Concrete-encased electrode.
- D. Rod electrode.

**1.5 PERFORAMNCE REQUIREMENTS**

- A. Grounding System Resistance: 5 ohms.

**1.6 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate all resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include all instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

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**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cadweld.
  - 2. Thermoweld.
  - 3. Copperweld Corp.
  - 4. Dossert Corp.
  - 5. Erico Inc.; Electrical Products Group.
  - 6. Galvan Industries, Inc.
  - 7. Harger Lightning Protection, Inc.
  - 8. Hastings Fiber Glass Products, Inc.
  - 9. ILSCO.
  - 10. Kearney/Cooper Power Systems.
  - 11. Korns, C. C. Co.; Division of Robroy Industries.
  - 12. Lyncole XIT Grounding.
  - 13. O-Z/Gedney Co.; a business of the EGS Electrical Group.
  - 14. Burndy "Hyground" compression system
  - 15. Thomas & Betts, compression system

**2.2 GROUNDING CONDUCTORS**

- A. For insulated conductors, comply with Section 26 0519 "Low-Voltage Power Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.
- N. Foundation Electrode: 4/0 AWG.

## **2.3 ROD ELECTRODES**

- A. Ground Rods: Copper-clad steel.
  - 1. Size: 3/4 inch diameter by 120 inches.
  - 2. Manufacturer: Blackburn; Eritech; Or equal.

## **2.4 GROUNDING WELL COMPONENTS**

- A. Well Pipe: 12 inch diameter by 24 inches long concrete pipe with belled end.
- B. Well Cover: Cast iron with legend 'GROUND' embossed cover.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
- E. Equipment Grounding Conductors: Comply with CEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by CEC are indicated.
  - 1. Install insulated equipment grounding conductors in feeders.
  - 2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at

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- equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
  4. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
    - a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
    - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
  2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- G. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- H. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- I. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  2. Make connections with clean, bare metal at points of contact.
  3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
  5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
  6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
  8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
  9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
  10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
  11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- J. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- K. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

### **3.2 FIELD QUALITY CONTROL**

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
  2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

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3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
  - a. Equipment Rated 500 kVA and Less: 10 ohms.
  - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
  - c. Equipment Rated More Than 1000 kVA: 3 ohms.
  - d. Manhole Grounds: 10 ohms.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Steel slotted support systems.
  - 2. Aluminum slotted support systems.
  - 3. Nonmetallic slotted support systems.
  - 4. Conduit and cable support devices.
  - 5. Support for conductors in vertical conduit.
  - 6. Structural steel for fabricated supports and restraints.
  - 7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
  - 8. Fabricated metal equipment support assemblies.
- B. Related Requirements:
  - 1. Section 26 0548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
    - d. Sockets.
    - e. Eye nuts.
    - f. Fasteners.
    - g. Anchors.
    - h. Saddles.
    - i. Brackets.
  - 2. Include rated capacities and furnished specialties and accessories.

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- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
  - 1. Hangers. Include product data for components.
  - 2. Slotted support systems.
  - 3. Equipment supports.
  - 4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for electrical systems.
  - 1. Include design calculations and details of hangers.
  - 2. Include design calculations for seismic restraints.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Ductwork, piping, fittings, and supports.
  - 3. Structural members to which hangers and supports will be attached.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Items penetrating finished ceiling, including the following:
    - a. Luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
    - f. Projectors.
- B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.



## **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M.
  - 2. AWS D1.2/D1.2M.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
  - 2. Component Importance Factor: 1.5 or 1.0.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

### **2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. ERICO International Corporation.
    - d. Flex-Strut Inc.
    - e. GS Metals Corp.
    - f. G-Strut.
    - g. Haydon Corporation.
    - h. Metal Ties Innovation.
    - i. Thomas & Betts Corporation; A Member of the ABB Group.
    - j. Unistrut; Part of Atkore International.
    - k. Wesanco, Inc.

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2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Material for Channel, Fittings, and Accessories: Galvanized steel.
  1. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
  2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Cooper Industries, Inc.
    - b. Flex-Strut Inc.
    - c. Haydon Corporation.
    - d. MKT Metal Manufacturing.
    - e. Thomas & Betts Corporation; A Member of the ABB Group.
    - f. Unistrut; Part of Atkore International.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Material: 6063-T5 aluminum alloy.
  4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
  5. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
  6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. Fabco Plastics Wholesale Limited.
    - d. G-Strut.
    - e. Haydon Corporation.
    - f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches or 13/16 inches.
  4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
  5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
  6. Rated Strength: Selected to suit applicable load criteria.
  7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.

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2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - 1) B-line, an Eaton business.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti, Inc.
    - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All Stainless - steel springhead type.
7. Hanger Rods: Threaded steel.

**2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

**PART 3 - EXECUTION**

**3.1 APPLICATION**

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  1. NECA 1.
  2. NECA 101
  3. NECA 102.
  4. NECA 105.
  5. NECA 111.
- B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least **25** percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

### **3.2 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.

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- 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

**3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

- A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

**3.4 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.5 PAINTING**

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 09 9113 "Exterior Painting"/Section 09 9123 "Interior Painting" and Section 09 9600 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

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- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

**1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer's specified.

**2.2 METAL CONDUIT AND TUBING**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflec Inc.
  - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 4. Electri-Flex Co.
  - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
  - 6. LTV Steel Tubular Products Company.
  - 7. Manhattan/CDT/Cole-Flex.
  - 8. O-Z Gedney; Unit of General Signal.
  - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.



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- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. EMT and Fittings: ANSI C80.3.
  - 1. Fittings: Compression type.
- F. FMC: Aluminum.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

**2.3 NONMETALLIC CONDUIT AND TUBING**

- A. Manufacturers:
  - 1. American International.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. Arnco Corp.
  - 4. Cantex Inc.
  - 5. Certainteed Corp.; Pipe & Plastics Group.
  - 6. Condux International.
  - 7. ElecSYS, Inc.
  - 8. Electri-Flex Co.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Manhattan/CDT/Cole-Flex.
  - 11. RACO; Division of Hubbell, Inc.
  - 12. Spiralduct, Inc./AFC Cable Systems, Inc.
  - 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

**2.4 SURFACE RACEWAYS**

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
  - 1. Manufacturers:
    - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
    - b. Thomas & Betts Corporation.
    - c. Walker Systems, Inc.; Wiremold Company (The).
    - d. Wiremold Company (The); Electrical Sales Division.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

## **2.5 BOXES, ENCLOSURES, AND CABINETS**

- A. Manufacturers:
  - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  - 2. Emerson/General Signal; Appleton Electric Company.
  - 3. Erickson Electrical Equipment Co.
  - 4. Hoffman.
  - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
  - 6. O-Z/Gedney; Unit of General Signal.
  - 7. RACO; Division of Hubbell, Inc.
  - 8. Robroy Industries, Inc.; Enclosure Division.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

## **2.6 FACTORY FINISHES**

- A. Finish: For raceway, enclosures, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

## **PART 3 - EXECUTION**

### **3.1 RACEWAY APPLICATION**

- A. Outdoors:
  - 1. Exposed: Rigid steel or IMC.
  - 2. Concealed: Rigid steel or IMC.

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3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
1. Exposed: EMT.
  2. Concealed: EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  4. Damp or Wet Locations: Rigid steel conduit.
  5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

**3.2 INSTALLATION**

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Section 26 0500 "Common Work Results For Electrical."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

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1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  2. Space raceways laterally to prevent voids in concrete.
  3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
  2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a

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flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where otherwise required by CEC.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

**3.3 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
  - 2. USB charger devices.
  - 3. GFCI receptacles.
  - 4. Twist-locking receptacles.
  - 5. Pendant cord-connector devices.
  - 6. Cord and plug sets.
  - 7. Toggle switches.
  - 8. Decorator-style convenience.
  - 9. Wall switch sensor light switches with ultrasonic sensors.
  - 10. Digital timer light switches.
  - 11. Wall-box dimmers.
  - 12. Wall plates.
  - 13. Floor service outlets.
  - 14. Poke-through assemblies.
  - 15. Prefabricated multioutlet assemblies.
  - 16. Service poles.

### **1.3 DEFINITIONS**

- A. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

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- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- H. UTP: Unshielded twisted pair.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

**PART 2 - PRODUCTS**

**2.1 GENERAL WIRING-DEVICE REQUIREMENTS**

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

**2.2 STRAIGHT-BLADE RECEPTACLES**

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  2. Eaton (Arrow Hart).
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Leviton Manufacturing Co., Inc.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
- B. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- C. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).



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2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

**2.3 USB CHARGER DEVICES**

- A. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
  3. USB Receptacles: Type A.
  4. Line Voltage Receptacles: two pole, three wire, and self-grounding.
- B. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, UL 1310, and FS W-C-596.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
  3. USB Receptacles: Type A.
  4. Line Voltage Receptacles: two-pole, three wire, and self-grounding.

**2.4 GFCI RECEPTACLES**

- A. General Description:
  1. 125 V, 20 A, straight blade, non-feed-through type.
  2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Pass & Seymour/Legrand (Pass & Seymour).
- D. Hospital-Grade, Duplex GFCI Convenience Receptacles: Comply with UL 498 Supplement sd.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

## **2.5 SPD RECEPTACLES**

- A. General Description: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.
  1. 125 V, 20 A, straight-blade type.
  2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
  3. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

## **2.6 TWIST-LOCKING RECEPTACLES**

- A. Twist-Lock, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).

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- b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- B. Twist-Lock, Isolated-Ground, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Grounding: Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

**2.7 PENDANT CORD-CONNECTOR DEVICES**

- A. Description:
  - 1. Matching, locking-type plug and receptacle body connector.
  - 2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
  - 3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
  - 4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

**2.8 CORD AND PLUG SETS**

- A. Description:
  - 1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
  - 3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

**2.9 TOGGLE SWITCHES**

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  2. Two Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  3. Three Way:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  4. Four Way:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
- C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

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- D. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- E. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- G. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- H. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- I. Toggle Switches: Square Face, 120/277 V, 15 A; comply with NEMA WD 1, UL 20, and FS W-S-896.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- J. Lighted Toggle Switches: Square Face, 120 V, 15 A; comply with NEMA WD 1 and UL 20.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: With LED-lighted handle, illuminated when switch is off.

## **2.10 WALL SWITCH SENSOR LIGHT SWITCH, ULTRASONIC**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.

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- B. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
  - 1. Connections: Provisions for connection to BAS.
  - 2. Connections: Hard wired.
  - 3. Connections: Wireless.
  - 4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
  - 5. Integral relay for connection to BAS.
  - 6. Adjustable time delay of 20 minutes.
  - 7. Able to be locked to Manual-On mode.
  - 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
  - 9. Comply with NEMA WD 1, UL 20, and FS W-S-896.

**2.11 DIGITAL TIMER LIGHT SWITCH**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.
- B. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
  - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
  - 2. Integral relay for connection to BAS.

**2.12 WALL-BOX DIMMERS**

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
  - 1. 600 W; dimmers shall require no derating when ganged with other devices.
- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

- E. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

## **2.13 WALL PLATES**

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
  - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

## **2.14 POKE-THROUGH ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Pass & Seymour/Legrand (Pass & Seymour).
  - 3. Square D; by Schneider Electric.
  - 4. Wiremold / Legrand.
- B. Description:
  - 1. Factory-fabricated and -wired assembly of below-floor junction box with multi-channelled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
  - 2. Comply with UL 514 scrub water exclusion requirements.
  - 3. Service-Outlet Assembly: Pedestal type with services indicated complying with requirements in Section 27 1513 "Communications Copper Horizontal Cabling."
  - 4. Size: Selected to fit nominal cored holes in floor and matched to floor thickness.
  - 5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
  - 6. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
  - 7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 27 1513 "Communications Copper Horizontal Cabling."

## **2.15 PREFABRICATED MULTIOUTLET ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:



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1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold / Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

**2.16 FINISHES**

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPD Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan-speed control are listed for that application.
  3. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

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- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

**3.2 GFCI RECEPTACLES**

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

**3.3 IDENTIFICATION**

- A. Comply with Section 26 0511 "Requirements for Electrical Installations".
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

**3.4 FIELD QUALITY CONTROL**

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
  - 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
  - 2. Test Instruments: Use instruments that comply with UL 1436.
  - 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 3. Using the test plug, verify that the device and its outlet box are securely mounted.
- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Receptacle switches.
  - 4. Shunt trip switches.
  - 5. Molded-case circuit breakers (MCCBs).
  - 6. Molded-case switches.
  - 7. Enclosures.

### **1.3 DEFINITIONS**

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.

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1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:
    - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  2. Fuse Pullers: Two for each size and type.

**1.8 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Accredited by NETA.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

**1.9 FIELD CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

**1.10 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: three year(s) from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

**2.2 GENERAL REQUIREMENTS**

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

**2.3 FUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. ABB Inc.
  - 2. Eaton.
  - 3. General Electric Company.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.

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5. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
1. Single throw.
  2. Three pole.
  3. 600-V ac.
  4. 200 A and smaller.
  5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
  6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac
  6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  8. Service-Rated Switches: Labeled for use as service equipment.

**2.4 NONFUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Eaton.
  2. General Electric Company.
  3. SIEMENS Industry, Inc.; Energy Management Division.
  4. Square D; by Schneider Electric.
- B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

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- C. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Three Pole, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac
  - 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 8. Service-Rated Switches: Labeled for use as service equipment.

**2.5 RECEPTACLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.



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- D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- E. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
  - 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 8. Service-Rated Switches: Labeled for use as service equipment.

**2.6 SHUNT TRIP SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Bussmann, an Eaton business.
  - 2. Littelfuse, Inc.
  - 3. Mersen USA.
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

- E. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer or source of enough capacity to operate shunt trip, pilot, indicating and control devices.
- F. Accessories:
  - 1. Oiltight key switch for key-to-test function.
  - 2. Oiltight red ON pilot light.
  - 3. Isolated neutral lug; 100 or 200 percent rating.
  - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  - 5. Form C alarm contacts that change state when switch is tripped.
  - 6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac or 24-V dc coil voltage.
  - 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
  - 8. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 9. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 10. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 11. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
  - 12. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 13. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 14. Service-Rated Switches: Labeled for use as service equipment.

## **2.7 MOLDED-CASE CIRCUIT BREAKERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. NOARK Electric North America.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.
  - 5. Square D; by Schneider Electric.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker

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handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. \_\_\_\_\_ Amps Available. Identical Replacement Component Required."
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 167 deg F rated wire, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
- G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
  - 1. Instantaneous trip.
  - 2. Long- and short-time pickup levels.
  - 3. Long- and short-time time adjustments.
  - 4. Ground-fault pickup level, time delay, and I-squared t response.
- K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

- N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- O. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical/Compression type, suitable for number, size, trip ratings, and conductor material.
  - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered or remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 5. Communication Capability: Circuit-breaker-mounted, Universal-mounted or Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 26 0913 "Electrical Power Monitoring and Control."
  - 6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
  - 9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
  - 10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
  - 11. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
  - 12. Electrical Operator: Provide remote control for on, off, and reset operations.
  - 13. Accessory Control Power Voltage: Integrally mounted, self-powered.

## **2.8 MOLDED-CASE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. NOARK Electric North America.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.
  - 5. Square D; by Schneider Electric.

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- B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- D. Features and Accessories:
  - 1. Standard frame sizes and number of poles.
  - 2. Lugs:
    - a. Mechanical/Compression type, suitable for number, size, trip ratings, and conductor material.
    - b. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 167 deg F rated wire, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
  - 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
  - 7. Alarm Switch: One NC contact that operates only when switch has tripped.
  - 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
  - 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
  - 10. Electrical Operator: Provide remote control for on, off, and reset operations.
  - 11. Accessory Control Power Voltage: Integrally mounted, self-powered.

**2.9 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1 or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R)
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover or directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R).

The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

#### **3.2 PREPARATION**

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Architect, Construction Manager and Owner written permission.
  - 4. Comply with NFPA 70E.

#### **3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS**

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

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5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 with cover attached by Type 316 stainless steel bolts.

**3.4 INSTALLATION**

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Section 26 0548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

**3.5 IDENTIFICATION**

- A. Comply with Section 26 0511 "Requirements for Electrical Installations".
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

**3.6 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections for Switches:
  1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.

- c. Verify that the unit is clean.
  - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
  - e. Verify that fuse sizes and types match the Specifications and Drawings.
  - f. Verify that each fuse has adequate mechanical support and contact integrity.
  - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
  - i. Verify correct phase barrier installation.
  - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
2. Electrical Tests:
- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
  - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

F. Tests and Inspections for Molded Case Circuit Breakers:



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1. Visual and Mechanical Inspection:
  - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, grounding, and clearances.
  - d. Verify that the unit is clean.
  - e. Operate the circuit breaker to ensure smooth operation.
  - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
  - h. Perform adjustments for final protective device settings in accordance with the coordination study.
2. Electrical Tests:
  - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
  - e. Determine the following by primary current injection:

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- 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
    - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
    - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
    - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
  - f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
  - g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
  - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
  - i. Verify operation of charging mechanism. Investigate units that do not function as designed.
  3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  4. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- G. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports.
1. Test procedures used.

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2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

**3.7 ADJUSTING**

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0573.16 "Coordination Studies."

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Work included.
  - 2. Work by others.
  - 3. Dimensional tolerances for accessibility.
  - 4. Contractor's use of premises.
  - 5. Work sequence.
  - 6. Owner occupancy.
  - 7. Existing utilities.
  - 8. Asbestos.

**1.2 WORK INCLUDED**

- A. Under a single contract construct the Victor Elementary School - HVAC Replacement, Lodi Unified School District located in Stockton, CA. Work includes:
  - 1. Removal of existing HVAC units at Buildings A and B, including all electrical and gas connections.
  - 2. Installation of new HVAC units.
  - 3. New platforms for condensing units, including roofing and waterproofing.
  - 4. Controls as shown.
  - 5. Other work as shown in the documents and as required for a complete an operational project.

**1.3 WORK BY OTHERS**

- A. Work on the Project which will be executed prior to start of Work of this Contract, and which is excluded from this Contract, is as follows:
  - 1. Owner will remove furniture, supplies, drapes and salvageable items. Owner will not remove finishes or expose structure in support of Contractor's work.
- B. Work in the Project which will be executed after completion of Work of this Contract, and which is excluded from this Contract, as follows:
  - 1. None
- C. Work on this Project which will be executed during the Work of this Contract which the Contractor shall coordinate with and facilitate:
  - 1. None

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**1.4 DIMENSIONAL TOLERANCES FOR ACCESSIBILITY**

- A. While it is recognized that construction practices generally permit a level of reasonable dimensional tolerance, the installation of any items subject to compliance with the Americans with Disabilities Act Accessibility Guidelines and Chapter 11B of the California Building Code (CBC), which are not shown with dimensional tolerances, on the drawings or in the CBC, shall be considered absolute. These dimensions will be strictly enforced. Items found to be out of tolerance may require modification and/or replacement at contractor's expense.

**1.5 CONTRACTOR'S USE OF PREMISES**

- A. Specific roads for access to and from building sites will be agreed on with the Owner. All traffic and materials delivery shall be confined to these roads.
- B. Specific areas for storage of materials and site fabrication will be agreed upon. Contractor's activities shall be confined to these areas.
- C. Work shall proceed in such manner as to not interfere with Owner's activities in and about nearby facilities. Exceptions will be made only after previous agreement between Owner, Architect and Contractor.
- D. Fire alarm, intercom, intrusion alarm and other such tests shall be conducted outside of school hours and shall be coordinated with site personnel, if such tests occur after occupancy.

**1.6 WORK SEQUENCE**

- A. Schedule and construct work in stages to accommodate Owner's use of the premises before and after the primary construction period. Coordinate the construction schedule and operations with the Owner's representative. The three stages of the construction process following the bid award shall be:
  - 1. Pre-construction Stage: Pre-construction activities shall occur from the start date, to the first day of availability. Activities shall include, but are not limited to:
    - a. Project scheduling/subcontractor coordination
    - b. Identification of long lead materials and equipment
    - c. Temporary facilities and controls
    - d. Action submittals as specified, including:
      - 1) Shop drawing submittals
    - e. Material ordering (particularly long lead items)
    - f. Material stock piling
    - g. Field measuring
    - h. The architect and engineers will expedite all long lead item submittals as quickly as possible. Such items must be indicated as "critical" when submitted. Substitutions of finishes, materials and equipment will not be permitted due to the lack of availability unless submittals are made early and completely.

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2. Construction Stage: Primary construction activities shall occur from the date of availability, through the Date of Substantial Completion. Activities shall include work as described by the construction documents.
    - a. It is the intention of the owner to make these buildings available on the dates indicated below. Certain units also may be available earlier than the dates shown.
    - b. Due to the nature of the work and the type of facilities, the schedule is fixed and cannot be altered. The premises will not be available prior to date of availability. All primary work must be completed prior to Date of Substantial Completion. Critical work, includes life safety, HVAC, plumbing, electrical service, security and general construction. Temporary measures will be required if primary work is uncompleted at start of school date.
    - c. As the Owner needs time for preparing classrooms for the new school session, the Contractor shall turn over spaces in an orderly sequence to allow occupancy and use of the spaces over the final 2 weeks of the construction period. This schedule must be prepared with the Owner's input.
  3. Completion/Close-out Stage: Completion and close-out activities shall occur from Date of Substantial Completion to Final Completion. Activities shall include:
    - a. Completion of minor finish work. Minor work shall be considered completion or installation of items which will not interfere or hinder the Owner from utilizing the facility, such as touch-up painting, hardware adjustment, etc.
    - b. Punch list work.
    - c. Project close-out.
    - d. All work performed during this period must occur outside of normal school hours. Arrangements must be made with the owner representative and work schedules approved.
- B. Delays:
1. Minor delays: Minor delays caused by parties other than the Contractor, such as the Owner or Architect will not be considered critical path delays and will not result in a time extension to the project schedule. Minor delays shall be defined as delays due to the need for review, clarifications, consideration, detailing, etc. which typically do not last more than 48 hours, are addressed promptly and solved without significant changes to the work, as determined solely by the Architect. Such items which may cause delay must be identified by the Contractor at the time of origin.
  2. Other delays: Other delays caused by unknown or unforeseen conditions or significant changes or modifications requested by or required by the Owner, Architect or DSA, will be permitted only if promptly submitted, reviewed and approved by the Architect and Owner. Such delays may result in time extensions to specific work or areas of work only, and not to other unaffected portions of the project. Such delays must directly affect the critical path of the work, be shown as unavoidable and be unable to be made up through rescheduling.
- C. Occupancy: The project will be occupied by the School Staff as shown below. Dates are fixed and cannot be changed. The premises will be occupied whether or not the work is completed regardless of time extensions (if any). Any work performed after this

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date will need to be fully coordinated with the Owner and will be limited to after school hours or weekends.

**D. Project Schedule:**

1. The following schedule summarizes the major activity dates (Dates are approximate and actual start dates are subject to change):

a.	Bid	Dates
	1) Advertise to Bid (first)	October 10, 2023
	2) Advertise to Bid (second)	October 17, 2023
	3) Pre-Bid Conference	October 19, 2023
	4) Addendum (last)	October 26, 2023
	5) Bids Due	October 30, 2023
	6) Board Award	November 7, 2023
b.	Contracts	
	1) Bond Preparation	November 8 - 15, 2023
	2) Contract Execution	November 16, 2023
c.	Pre-Construction Activities	
	1) Start Date	November 20, 2023
	2) Submittals and Approvals	Nov 20, 2023 - Jan 20, 2024
	3) Materials Ordering/Stockpiling	December 2023 - May 2024
	4) School Concludes for Summer	May 31, 2024
d.	Construction	
	1) Date of facility availability	June 1, 2024
	2) Construction, All Units	June 1, 2024 - July 23, 2024
	3) Begin turning over spaces to District	July 17, 2024
e.	Occupancy: In order to accommodate a phased occupancy by the Owner, the Contractor will turn the buildings over for occupancy as follows:	
	1) Occupancy - Staff	July 24, 2024
	2) Occupancy - Students	August 1, 2024
f.	Completion/Close-out	
	1) Substantial Completion Date	July 17, 2024
	2) Complete Minor Finish Work	July 31, 2024
	3) Complete Punch List Work	July 31, 2024
	4) Closeout/Completion	August 31, 2024

**1.7 OWNER OCCUPANCY**

- A. Owner will occupy nearby premises during construction.
- B. Refer to General Conditions for requirements for partial occupancy by Owner.
- C. Owner will not occupy buildings included in this scope of work during the primary construction period. However, occupancy will occur as shown above.

- D. Owner may occupy other buildings on premises during construction and may be present on site during summer construction period.

## **1.8 EXISTING UTILITIES**

- A. It is recognized by the District and the Contractor that the location of existing utility facilities as shown on contract drawings and specifications are approximate; their exact location is unknown.
- B. Recognition is given to the fact there may be additional utilities existing on the property unknown to either party to the Contract. Location of utilities as shown on drawings and specifications represent the best information obtainable from utility maps and other information furnished by the various agencies involved. The Owner warrants neither the accuracy nor the extent of actual installations as shown on the drawings and specifications.
- C. Because of this uncertainty, it may become necessary for the Architect to make adjustments in the line or grade of sewers or storm drains. Installation of such adjusted lines shall be made at the regular unit price bid for the work, and no additional compensation will be paid therefore, unless the scope and character of the work has been changed.
- D. The Contractor agrees and is required to coordinate and fully cooperate with the Owner and utility owners for the location, relocation, and protection of utilities. The Contractor's attention is directed to the existence of utilities, underground and overhead, necessary for all buildings within the area of work. Prior to start of trenching operations, the Contractor shall meet with Owner Representative(s) to fully review known utility locations which may affect the work.
- E. In accordance with Section 4215 of the Government Code of the State of California, the Owner shall make provisions to compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating such main and trunk line utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work. Compensation will be in accordance with the provisions of these specifications providing for change orders. Nor shall the Contractor be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the Owner or owner of the utility to provide for removal or relocation of such utility facilities.
- F. Nothing herein shall be deemed to require compensation to the Contractor or to relieve him from being assessed liquidated damages for such delay when the presence of unidentifiable utilities can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of construction, and the damage to existing utilities or delay was caused in whole or in part by a failure of the Owner to indicate the presence of such service laterals or appurtenances.
- G. In the event the Contractor discovers utilities not identified in the Contract plans or specifications, the Contractor shall immediately notify the Architect and the utility owner by the most expeditious means available and later confirm in writing.



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- H. Existing building utilities shall not be interrupted during normal operating hours.

**1.9 HAZARDOUS MATERIALS**

- A. Prior to start of work, the Contractor shall obtain and review the Owner's hazardous materials report on any existing facilities to become familiar with existing conditions.
- B. If asbestos or hazardous materials identified in the report are not fully addressed in the contract documents, the contractor shall bring this to the attention of the Architect prior to start of construction for clarification.
- C. Should asbestos or hazardous materials outside of the scope of work be discovered during construction operations, the contractor shall immediately notify the Project Inspector and Architect and shall suspend work in the area until necessary identification, testing and abatement (if required) is completed.

**END OF SECTION**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pre-construction Meeting.
  - 2. Regular project meetings.
  - 3. Pre-installation meetings.

**1.2 GENERAL**

- A. The Architect shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to the Owner, Project Inspector, Contractor, participants, and others affected by the decisions made.
- B. Attendance required: Project Superintendent, Project Manager (if any), major Subcontractors (as requested), Architect, Project Inspector, and others as appropriate to the meeting topics.

**1.3 PRE-CONSTRUCTION MEETING**

- A. Upon issuing a notice of intent to award the contract, the Architect will schedule a pre-construction meeting.
- B. Agenda: Architect and Contractor shall prepare an agenda and distribute copies at least one week in advance of the Pre-Construction meeting.
- C. Architect's agenda may include, but not limited to, discussion of the following items:
  - 1. Project description and scope of work.
  - 2. Accepted alternates.
  - 3. Temporary facilities and use of the site.
  - 4. Environmental procedures.
  - 5. Hazardous materials and abatement
  - 6. Legal and code requirements.
  - 7. Designation of personnel representing the parties to the contract; lines of communication.
  - 8. Communication and responsibilities.
  - 9. Submittal procedures in accordance with Section 01 3300.
  - 10. Construction schedule and critical path.
  - 11. Schedule of values.
  - 12. Record drawings.
  - 13. Progress payments.
  - 14. Change orders and time extensions (related to critical path).
  - 15. Inspection and testing.

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16. Project closeout.

**1.4 PROJECT MEETINGS**

- A. The Architect will schedule and run weekly or bi-weekly project meetings throughout the project to review the short-term project schedule and to discuss issues requiring resolution. It is the duty of the Contractor to attend, participate in, and comply with the agreements reached and direction set at these meetings.

**1.5 MONTHLY MEETINGS**

- A. The Architect shall schedule and run monthly meetings for the purpose of assessing progress, approving payment, resolving problems, and addressing mid-range and long-range scheduling issues.

**1.6 PRE-INSTALLATION MEETINGS**

- A. The Contractor shall schedule and run pre-installation meetings in accordance with the product specifications.

**1.7 SPECIAL MEETINGS**

- A. The Architect may occasionally schedule special meetings for the purpose of discussing work requiring a significant coordination effort or for resolving issues which require more attention than they can be given in the regularly scheduled meetings. The Contractor shall attend these meetings along with representatives of subcontractors, suppliers, and/or manufacturers when appropriate for the subject matter to be discussed.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

**A. Section Includes:**

1. Requirements for the following:
  - a. Electronic Data Transfer.
  - b. Substitutions: Specific procedures for submission and approval of products other than those specified or noted on the Drawings.
  - c. Procedures for processing of Contractors "Requests for Interpretation" (RFI) questions.
2. Procedures to be followed in preparing and submitting the following:
  - a. Subcontractor List.
  - b. Progress Schedule.
  - c. Schedule of Values.
  - d. Shop Drawings.
  - e. Product Data/Material Lists.
  - f. Samples.
  - g. Requests for Information (RFI).
  - h. Record Drawings.
  - i. Certifications including those required for material VOC content.
  - j. Maintenance/Operating Manuals.
  - k. Warranties and Extended Guarantees.
  - l. Extra Stock.
3. Substitution Procedures: Specific requirements for submission and approval of products other than those specified or noted on the Drawings.
4. Procedures for processing of Contractors "Requests for Interpretation" (RFI) questions.
5. Electronic Data Transfer.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions; "Accessory Material VOC Content Certification Form."
- B. Section 01 7700, Closeout Procedures.
- C. Section 01 7836, Warranties; guarantee/warranty forms.
- D. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.
- E. Test reports: Pertinent Specification Sections (by testing lab).

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- F. Individual requirements for submittals also are described in other Sections of these Specifications.

**1.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples indicated in individual Specification Sections as informational submittals that do not require Architect's responsive action.
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. General;
  - 1. Shop drawings, product data, and samples are in no case to be considered Contract Documents but are to be treated only as instruments of convenience and facility to further the progress of the Work.
  - 2. Miscellaneous systems not specifically specified but installed to meet code requirements or for other reasons are subject to Architect's review prior to installation.
- B. Shop drawings, product data, samples and supporting data shall be prepared by Contractor or its suppliers but shall be submitted to Architect by Contractor as the instruments of the Contractor.
- C. Coordination of Submittals:
  - 1. Before submitting a shop drawing or any related material to Architect, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, which are the sole responsibility of the Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. By affixing the Contractor's signature to each submittal, the Contractor certifies that this coordination has been performed.
  - 2. Architect shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Architect otherwise via a written instrument which is acknowledged by the Architect in writing.
- D. Grouping of Submittals:
  - 1. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.

2. Partial submittals may be rejected as not complying with the provisions of the Contract. The Contractor may be held liable for delays so occasioned.
- E. Architect will check submittals for conformance with design concepts of project. Approval by Architect covers only such conformance. Effort will be made by Architect to discover any errors, but responsibility for accuracy and correctness of submittals shall be with the Contractor.
- F. Approval of submittals will be on a general basis only and shall not relieve the Contractor from their responsibility for proper fitting and construction of the Work, nor from furnishing materials and labor required by the Contract which may not be indicated on the submittals when approved.
- G. No portion of the work requiring submittals shall be commenced until the submittal for that portion of the work has been approved by Architect. All such portions of work shall be in accordance with the approved submittals. Any work performed without approved submittals will be done so at the Contractor's own risk. Work found not to be in compliance with the approved submittals shall be removed and corrected at the Contractor's own expense.
- H. The Contractor shall make corrections required by Architect and shall resubmit as required by Architect the required number of corrected copies of shop drawings, product data, or new samples until approved. Contractor shall direct specific attention in writing or on resubmittals to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than two (2) re-reviews of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor.

## **1.5 ELECTRONIC DATA TRANSFER**

- A. Requests for Electronic Data will be considered upon receipt of written request by the Contractor accompanied by a signed copy of the Electronic Data Request Form (included with this section). Request should clearly outline specific Drawings desired and the intent of the request.
  1. Submit Electronic Data Request Form on standard form.
  2. Allow 72 hours minimum for review and consideration by Architect.
- B. Electronic data files are not a part of the contract documents, but rather a convenience for the Contractor in preparation of his required submittals and layout efforts. Electronic files do not alter the content or meaning of the hard copy documents which may be a part of the Contract Documents.
- C. The electronic data files will remain the property of the Architect, shall not be used for any other purpose than that purpose stated in the Electronic Data Request Form, and shall not be released by the Contractor or any subcontractor to any other party without written consent from the Architect.
- D. The electronic data files are distributed for reference only. Transferring such files can alter, delete or change original information. Accuracy of the data cannot be guaranteed

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as correct or complete and the Contractor accepts full responsibility for inaccuracies, regardless of cause.

- E. The hard copy documents, including addenda and subsequent written changes to the documents, represent the complete work of the Contract. Electronic files should be cross-referenced to the Contract Documents by the user and verified from that the information included contains the necessary Contract information. It is the Contractor's responsibility to make any changes or revisions to the electronic data files as necessary.
- F. Architect may, at his complete discretion and without explanation, approve or deny requests for electronic data.

**1.6 SUBSTITUTIONS**

- A. Architect's Approval Required:
  - 1. Contract is based on materials, equipment and methods described in Contract Documents. Substitutions will not be reviewed and approved prior to the award of the contract.
  - 2. Architect will consider proposals during the submittal process for substitution of materials, equipment and methods only when such proposals are accompanied by full and complete technical data and other information required by Architect to evaluate proposed substitution. Substitution shall be submitted with completed Substitution Request Form, included with this section.
  - 3. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this work by Architect.
- B. "Or Equal": Whenever, in Contract Documents, any material, process or specified patent or proprietary name and/or by name of manufacturer is indicated, such name shall be deemed to be used for purpose of facilitating description of material and/or process desired, and shall be deemed to be followed by the words "or equal" and Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor shall furnish material, process or article specified or one that in opinion of Architect is equal thereof in every respect.
- C. "No Substitutions": Items indicated as "No Substitutions" shall be provided as specified and no alternates will be allowed. These items are required either due to standards implemented by the Owner or to match materials recently installed by others.
- D. Coordination: Approval of substitution shall not relieve Contractor from responsibility for compliance with requirements of Drawings and Project Manual, and Contractor shall be responsible at his own expense for any changes in other parts of its own work or work of others which may be caused by approved substitution.
- E. DSA Approval: Substitutions of certain items may cause such items to require a Deferred Approval by DSA. Should a DSA Deferred Approval be required, the Contractor shall provide information and documents necessary to complete the Deferred Approval process without any additional costs to the Owner, including engineering, calculation and modification of substitute products.

## **PART 2 - SUBMITTALS**

### **2.1 SUBCONTRACTOR LIST**

- A. Provide a typed list of Subcontractors within 5 days of notice of the award of contract. Include Subcontractor name, address, phone number, license number and trade.

### **2.2 PROGRESS SCHEDULE**

- A. Prepare and submit estimated progress schedule for work within 10 calendar days after issuance of Notice to Proceed. Submit up-dated schedules:
  - 1. At mid-point of construction.
  - 2. When time extensions of more than two weeks are necessary.
- B. Relate progress Schedule to entire Project. Indicate following:
  - 1. Dates for starting and completion of various sub-contracts.
  - 2. Dates for submission of required submittals.

### **2.3 SCHEDULE OF VALUES**

- A. Before first Application for Payment, submit for Architect's approval a Schedule of Values of various portions of work, aggregating total Contract sum, divided so as to facilitate payment to subcontractors, prepared in such form as Architect and Contractor may agree upon, and supported by such data to substantiate its correctness as Architect may require.
  - 1. Breakdown shall include separation of sitework from building work for main categories including electrical, plumbing, concrete, etc. Separations shall also be provided for each building of a multiple building contract. Include proper share of overhead and profit with each item in Schedule of Values.
  - 2. This Schedule, when approved by Architect, shall be used as basis for Contractor's applications for payment. Payment will not be released until a Schedule of Values is accepted.
- B. Schedule of Values shall appear similar to the following list and generally following the Table of Contents of this Project Manual as the format for listing component items. It shall be detailed at least as shown and portions shall not be more largely grouped so as to reduce its length unless appropriate to the scope of the Work. Mobilization/Start-up is limited to 2 percent on contracts greater than \$1,000,000 and 4 percent on contracts less than \$1,000,000. Contract closeout to be a minimum of 2 percent.
  - 1. Mobilization/Start-up.
  - 2. Temporary Facilities.
  - 3. Structural Steel/Metals.
  - 4. Lumber.
  - 5. Roofing.
  - 6. Roof Hatches.



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7. Caulking and Sealants.
8. HVAC/Sheet Metal.
9. Electrical – Building.
10. Labor/Supervision.
11. Cleanup.
12. Contract Closeout.

**2.4 SUBMITTAL SCHEDULE**

- A. Contractor shall prepare and submit to Architect a "Submittal Schedule" when required by the General Conditions showing scheduled dates of submittals and date required for return of submittals to Contractor.
- B. Contractor shall provide in Schedule the minimum specified working days for Architect to review and check submittals provided it is not a deferred approval item. Based on the number and complexity of submittals at any one time, Architect's review period may be longer than the days specified.
- C. Dates on "Submittal Schedule" shall be agreed upon by both Architect and Contractor.

**2.5 PROJECT DIRECTORY**

- A. After execution of the Contract but prior to commencement of Work, Contractor shall submit to Architect a Project Directory listing subcontractors and vendors on the Project and giving a brief description of their scope of work, firm name, contact person, address, phone number, e-mail address, and fax number if used.

**2.6 SHOP DRAWINGS**

- A. Submit shop drawings as a copy of the original set maintained by the Contractor. Shop drawings are to include the name of the project, the name of Contractor and are to be numbered consecutively. Provide legible and complete copies in every respect. Provide quantity as described below. Do not reproduce the Contract Drawings in lieu of Contractor or subcontractor produced shop drawings.
- B. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on Drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of the Contract Documents. Unless specific changes have been noted and approved, no deviations from Contract Documents will be accepted.

**2.7 PRODUCT DATA / MATERIAL LISTS**

- A. Manufacturer's Standard Schematic Drawings:
  1. Modify Manufacturer's drawings to delete information which is not applicable to the Project.
  2. Supplement standard information to provide additional information which is applicable to the Project.

- B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
  - 1. Clearly mark each copy to identify pertinent materials, products or models. Mark out or remove extraneous information.
  - 2. Show dimensions and clearances required.
  - 3. Show performance characteristics and capacities.
  - 4. Show wiring diagrams and controls.

## **2.8 SAMPLES**

- A. Samples: Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
  - 1. Include identification on samples including product and material and location of proposed work.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of product or material, with integrally related parts and attachment devices.
  - 2. After review, samples may be used in construction of project.
- C. Field samples and mockups:
  - 1. Erect at project site at location acceptable to Architect.
  - 2. Construct each sample or mockup complete, including work of trades required in finished work.

## **2.9 REQUESTS FOR INFORMATION (RFI)**

- A. Requests for additional information (RFI's) beyond that set-forth in the Contract Documents will be considered when the request is in writing and fully documented. Requests shall state the source and reason for the request; identify specific references within the Contract Documents pertinent to the request; and supply supporting information to assist the Architect in his/her response. Verbal responses to such requests are to be considered informational; official response will only be given in writing.
  - 1. Submit RFI's on standard form, included with this Section, and numbered consecutively.
  - 2. Allow a minimum of 72-hours for review by Architect. Additional time may be required for more complex issues.
  - 3. Provide suggested solution on standard RFI form where indicated.
  - 4. Provide detailed cost estimate for RFI's that are anticipated to exceed \$500 in extra costs to the Owner.
- B. Because RFI's are used for clarification or Construction Document interpretation purposes, the response will be issued back to the Contractor in the space provided on the standard RFI form. More complex issues requiring Contract Document revisions and/or which may result in a change in cost to the Contract will be handled using a

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Construction Change Document (CCD). RFI's and CCD's will not be used to address simple or minor coordination or construction issues which can normally be addressed quickly and easily by the Contractor or in conjunction with the Contractor and Architect. RFI's deemed unnecessary or frivolous by the Architect will be returned to the Contractor for reconsideration or will be rejected. RFI's so returned shall be removed from the RFI log and noted as unnecessary.

**2.10 CERTIFICATIONS**

- A. Where specifically indicated by pertinent Specification Sections, submit proper certification of recognized producer or association in lieu of or in addition to testing. Certification shall attest to product's compliance with requirements of Contract Documents.
- B. Certifications for this project shall also include:
  - 1. Fire Alarm System Certification:
    - a. As specified in Division 28.
  - 2. Megger Grounding Test Certificate:
    - a. Submit completed Megger Grounding Test Certificate (included with this section) with Testing Agency reports attached, as specified in Division 26.
  - 3. Certificate of Compliance for Building Materials:
    - a. Submit completed Certification of Compliance for Building Materials (included with this section).

**2.11 MAINTENANCE / OPERATION MANUALS**

- A. General: Contractor shall incorporate in Maintenance/Operation Manual(s) brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance. These items include carpets, resilient flooring, architectural finishes, mechanical and electrical equipment and other items as required elsewhere in Contract Documents. Prepare manuals in durable plastic loose leaf binders sized to accommodate 8-1/2 x 11 sheets with following minimum information:
  - 1. Identification on or readable through, front cover stating general nature of manual.
  - 2. Neatly typewritten index of contents.
  - 3. Site plan and building plans indicating location of equipment referenced (reduced scale).
  - 4. Complete instructions regarding operation and maintenance of equipment involved.
  - 5. Complete nomenclature of replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.
  - 6. Copy of warranties issued, in a separate binder as specified in this Section.
  - 7. Copy of approved shop drawings (reduced scale) with data concerning changes made during construction.
- B. Extraneous Data:

1. Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in the Project installation and delete, or otherwise clearly indicate, manufacturer's data with which the Project installation is not concerned.
- C. Materials shall be organized in a logical and consistent manner, by Specification Section number, with separating tabs clearly marked.
- D. When submitting electronic file via Newforma, materials shall be organized in order ascending by Specification Section number and including clear separation within one pdf file, following format prescribed in paragraphs A and B of this Article.

## **2.12 WARRANTIES AND GUARANTEES**

### **A. Contractor Standard Guarantee:**

1. Furnish Owner with its Standard Guarantee for work executed under this Contract, including approved extra work, to be absolutely free of defects of workmanship and materials for a period of two (2) years from the date of filing of the Notice of Completion.
2. Under the terms of its warranty, Contractor shall guarantee to repair and make good defects and repair damage to other work caused thereby which may occur during the Warranty period at no cost to the Owner.
3. Guarantees and warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect the Guarantee and Warranty between Contractor and Owner.
4. Contractor's Standard Guarantee shall be submitted on the Guarantee/Warranty form included in Section 01 7836, Warranties.

### **B. Subcontractor Standard Guarantee:**

1. Contractor shall countersign and furnish Owner with a Subcontractor Standard Guarantee from each Subcontractor for their work executed under this Contract, and approved extra work, to be free of defects of workmanship and materials for a period equal to the Contractor Standard Guarantee.
2. Under the terms of its warranty, Subcontractor shall guarantee to repair and make good defects and repair damage to other work caused thereby which may occur during the Warranty period at no cost to the Owner.
3. Subcontractors individual Standard Guarantee shall be submitted on Guarantee/Warranty form included in Section 01 7836, Warranties.

### **C. Special or Extended Guarantee/Warranty:**

1. In addition to the Contractor's and Subcontractor's Standard Guarantees, furnish Owner with special or extended warranties in excess of the Standard Warranty term of the Contract where specified in the respective Sections of the Specifications.
2. Where special or extended guarantees are related to work of a Subcontractor, the written Guarantee/Warranty form prepared by the Contractor shall be co-signed by the respective responsible subcontractor and a separate and addition

## **SUBMITTAL PROCEDURES**

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Guarantee/Warranty form shall be prepared by the Subcontractor and co-signed by the Contractor.

3. Each Special or Extended Guarantee/Warranty shall be submitted on the forms included in Section 01 7836, Warranties.
- D. Provide a binder with the executed Guarantee/Warranty forms placed in the order in which they occur in the Project Manual. Include an Index listing each Specification Section, specific items covered and length of warranty for each item.
- E. When submitting electronic file via Newforma, materials shall be organized in order ascending by Specification Section number and including clear separation within one pdf file.

## **2.13 RECORD DRAWINGS AND SPECIFICATIONS**

- A. The Contractor shall prepare and maintain on a current basis an accurate and complete set of Record Drawings and Annotated Specifications showing clearly the following:
  1. Changes, revisions, and substitutions during construction, including, without limitation, field changes.
  2. Addenda, Construction Change Documents and Clarifications issued by the Architect.
  3. The final location of mechanical equipment, ducts, outlets, structural members, walls, partitions, and other significant features. Note both vertical and horizontal dimensions of concealed installations.
  4. Installed locations of underground work and utilities, including storm drain piping, plumbing, electrical and stubs for future connections. Note both vertical and horizontal locations of underground facilities from permanent monuments such as building corners or other permanent structures, and finish grades.
  5. In the event of a specification that allows Contractor to elect one of several brands, makes, or types of material or equipment, the annotations shall show which of the allowable items the Contractor has furnished.
- B. The Contractor shall update the Record Drawings and Specifications as often as necessary to keep them current but no less often than weekly, and up-dated monthly, prior to and pursuant to approval of the progress payment application.
  1. Record drawings and specifications are to remain on site and available for inspection by the District Representative, Project Inspector and the Architect.
  2. Changes shall be made in an accurate and legible manner by a qualified draftsman acceptable to Architect.
  3. Symbols and designations used in preparing Record Drawings shall match those used in the Contract Drawings.
- C. At project completion, the Record Drawings and Annotated Specifications shall be submitted by the Contractor for Owner's Project Inspector and Architect review and comment.

1. These will be returned to the Contractor for revisions. Once corrections have been completed the Inspector shall sign and date the record set coversheet noting it as acceptance of the completed Record Drawings and Specifications.
2. Prior to Application for Final Payment, the original Record Drawings and Specifications are to be resubmitted to the Architect along with a scanned electronic file set in PDF format with each drawing bookmarked, matching the Drawing titles.
3. When submitting electronic file via Newforma, materials shall be organized in order ascending by Sheet Number as shown on the Drawing Sheet Index within one pdf file.

**D. Conditions of Payments:**

1. At the end of each month the Project Inspector will review the record drawings and specifications. If the records are incomplete, or incorrect, an appropriate amount of dollars, equivalent to the cost of uncovering the work to determine the locations of piping and the like, may be deducted from the next progress payment. The deducted sum will be withheld until the record drawings are updated and/or corrected.
2. Written confirmation from the District Representative that the record drawings and specifications have been properly updated weekly shall be submitted with each pay application request, and the existence of such properly updated records shall be a condition precedent to payment.
3. On completion of the Contractor's portion of the Work and prior to Application for Final Payment, the Contractor shall provide one complete set of approved Record Drawings and Specifications to the Owner, in format as specified, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work. Delays in the submission of complete record documents may subject the Contractor to liquidated damages.

**2.14 EXTRA STOCK**

- A. Provide extra stock and materials, as described in the individual Specification Sections, to the Owner at time of final acceptance.
- B. Materials shall be inventoried in writing, neatly packaged, with labels clearly identifying contents and quantities.
- C. Contractor shall obtain written acceptance of delivery from Owner.

**PART 3 - EXECUTION**

**3.1 GENERAL SUBMISSION REQUIREMENTS**

- A. This project is using Newforma Info Exchange for transmission and processing of project documentation. The Contractor is responsible for making contract submissions through this web accessed system. No supplementary software is required for use. User names and passwords will be granted at the beginning of the project.

**SUBMITTAL PROCEDURES**  
**SECTION 01 3300**  
**3431005**

- B. Contractor is responsible for the scheduling of submittals in order to avoid detrimental impact to the construction schedule and to support the timely sequence of the Work.
  - 1. Allow a minimum of 15-working days for submittal review by the Architect. Complex submittals or submittals which are not provided as complete packages may take longer than 15-working days for review.
  - 2. Contractor shall allow time for potential rejection and re-submittal of submittals which are being offered as substitution to the specified products.
- C. Contractor shall review submittals for completeness, coordination and conflicts between subcontractors and other Work in the Contract Documents.
  - 1. Subcontractors shall make submittals to Contractor.
  - 2. Submittals made by subcontractors which are not thoroughly reviewed by the Contractor will be returned. Submittals which vary significantly from the Contract Documents and are not so identified prior to submission, will be returned to the Contractor without review.
- D. Mechanical and electrical submittals, excluding underground work, shall each be packaged together so that products/components for these two major disciplines are transmitted to the Architect as a single submittal package for review.
- E. Submittals shall be accompanied by Submittal Transmittal, included at the end of this Section, addressed to the Architect. Each submittal transmittal shall:
  - 1. Be consecutively numbered.
  - 2. Re-submittals to have same submittal number as the original submittal with an alphanumeric suffix.
  - 3. Indicate Specification Section number. Separate submittals are required for each Specification Section involved.
  - 4. Include proper number of copies, as required in "Number of Copies Required" below.
  - 5. Contain index of items submitted, properly identified with Drawing numbers, etc.
  - 6. Substitutions shall be accompanied by a completed Substitution Request Form (included with the Project Manual).
- F. Electronic Submittals.
  - 1. Product data submitted electronically shall be submitted in .pdf format. Submittals shall be organized in a logical format grouping items and subsections together. The first page of each item or subsection must be bookmarked and properly labeled. If multiple fixtures or products are included in a single submittal, each item and corresponding information shall be separately grouped and bookmarked as noted above. This formatting and bookmarking shall also apply to other data submitted electronically like warranties/guarantees, maintenance & operations manuals and certifications.
  - 2. Shop drawings submitted electronically shall be submitted in .pdf format. Shop drawings shall be organized in a logical format grouping sections together (plans, elevations, details, schedules, etc.). Each sheet of the shop drawings shall be

bookmarked and properly labeled. Plan references and detail callouts shall be hyperlinked to properly jump to the referenced page or detail.

G. Number of Copies Required - Contractor shall submit following number of copies:

1. Subcontractor List: 1-electronic copy in PDF.
2. Progress Schedule: 1-electronic copy in PDF.
3. Schedule of Values: 1-electronic copy in PDF.
4. Shop Drawings: 1-electronic copy in PDF format.
5. Product Data/Material Lists: 1-electronic copy in PDF format.
6. Samples: As specifically indicated in the respective Specification Section or, if not indicated, two more than the Contractor requires to be returned.
7. Samples for Color/Pattern Selection: One set of manufacturer's complete range for initial selection; and 4 samples as requested of selected color/pattern for inclusion in final color boards.
  - a. As color selection is dependent on multiple submittals, it is critical that items requiring color decisions be submitted as early as possible and at the same time.
  - b. Selections will not be finalized until color dependent/selection submittals are received.
8. Substitution Request: 1-electronic copy in PDF.
9. Request for Information: 1-electronic copy in PDF.
10. Electronic Transfer: 1-electronic copy in PDF.
11. Certifications: 1-electronic copy in PDF.
12. Maintenance/Operations Manuals: After approved via Newforma submittal, 1-hard copy plus 1-electronic copy in format acceptable to the Owner.
13. Guarantees/Warranties: After approved via Newforma submittal, 1-hard copy, plus 1-electronic copy in format acceptable to the Owner. Refer to Section 01 7836, Warranties, for forms and additional requirements for assembly of guarantees/warranties.
14. Record Drawings: After approved via Newforma submittal, 1-hard copy plus 1-electronic copy in format acceptable to the Owner.

H. Submittals shall include the following, as applicable:

1. Date and revision dates.
2. Project title and number.
3. The names of Architect, Contractor, Subcontractor and supplier or manufacturer.
4. Identification of product or material.
5. Relation to adjacent structure or material.
6. Field dimensions, clearly identified as such.
7. Specification section number.
8. A blank space for Architect's stamp.



## **SUBMITTAL PROCEDURES**

### **SECTION 01 3300**

**3431005**

9. Contractor's stamp on each, initialed or signed, certifying that submittal was reviewed, field measurements have been verified and submittal is in compliance with the applicable Specification Section and the overall Contract Documents.

- I. Incomplete, inaccurate or non-complying submittals requiring revisions, re-submittal and additional review time, shall not be considered as a basis for Contract time extension.

### **3.2 PROCEDURES FOR ACTION SUBMITTALS**

- A. Action Submittals are identified in the respective Specification Section and shall be submitted in accordance with the specified web based access system.

- B. Number of Copies: As specified under Article "General Submission Requirements."

- C. Architect's Review:

1. General:

- a. Except for finish, color, and other aesthetic matters left to Architect's decision by Contract Documents, Architect's review is only for Contractor's convenience in following work and does not relieve Contractor from responsibility for deviations from requirements of Contract Documents.
- b. Do not construe Architect's review as a complete check or relief from responsibility for errors or omissions of any sort in shop drawings or schedules or from necessity of furnishing work required by Contract Documents that may not have been shown on shop drawings.
- c. Architect's review of a separate item does not indicate review of complete assembly in which it functions.
- d. Review comments of the Architect (or its consultants) will be shown when it is returned to the Contractor. The Contractor shall make and distribute such copies as are required for its purposes.

- D. Processing:

1. Architect will review Action Submittals in accordance with agreed upon "Submittal Schedule" and will return them to Contractor with Architect's stamp.
2. Notations by Architect which increase Contract cost or time of completion shall be brought to Architect's attention before proceeding with work. Failure to do so will result in the increased costs being borne by the Contractor.
3. Each submittal will be stamped indicating appropriate action to be taken by the Contractor.
4. If for any reason the Contractor cannot comply with the notations, Contractor shall re-submit submittal. In the transmittal letter accompanying the re-submittal, clearly describe the reason(s) for not being able to comply with the notations.

- E. Action and Distribution:

1. Architect will stamp submittals and Contractor shall comply with action noted on the Architect's "Submittal Review" stamp.

2. Unless otherwise directed for mutually agreed or required by the Architect's stamp, Architect will return submittals to the Contractor via the specified web access system.
  3. If corrections are required, the Contractor is responsible for making the necessary corrections and re-submitting the shop drawings in a timely fashion as to not affect the project schedule.
  4. The Contractor shall secure final acceptance prior to commencing work involved.
- F. Consultants' Review:
1. Submittals requiring review by Architect's or Owner's consultants shall be uploaded to the specified web access system for distribution by the Architect.
  2. Processing shall be in accordance with consultants stamp.
    - a. If action required by consultants stamp is not clear, Contractor shall immediately notify the Architect for a clarification.
    - b. If returned submittal also includes the Architect's stamp, processing shall be in accordance with the Architect's stamp.
- G. Revisions:
1. If revisions are required, the Contractor is responsible for making the necessary changes pertinent to by comments noted on the submittal and re-submitting the shop drawings in a timely fashion as to not affect the project schedule.
  2. If the Contractor considers any required revision to be a change, they shall so notify the Architect.
  3. Show each revision by number, date, and subject in a revision block on the submittal.
  4. If for any reason Contractor cannot comply with the notations, Contractor shall resubmit submittal.
- H. Revisions after Review: When a submittal has been reviewed by the Architect, resubmittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary.

### **3.3 PROCEDURES FOR INFORMATIONAL SUBMITTALS**

- A. Informational Submittals are identified in the respective Specification Section and shall be submitted in accordance with the specified web based access system.
- B. Number of Copies: As specified under Article "General Submission Requirements."
- C. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- D. Test and Inspection Reports: Comply with requirements specified in Section 01 4523, Testing and Inspection Services.

**SUBMITTAL PROCEDURES**  
**SECTION 01 3300**  
**3431005**

**3.4 PROCEDURES FOR CLOSEOUT AND MAINTENANCE MATERIAL SUBMITTALS**

- A. Closeout and maintenance material submittals are identified in the respective Specification Section and shall be submitted as specified or, if not specified, in accordance instructions provided by the Architect.
- B. Comply with the additional requirements specified in Section 01 7700, Closeout Procedures.

**3.5 FORMS**

- A. The following submittal forms are included as part of this Section.
  - 1. Submittal Transmittal.
  - 2. Substitution Request.
  - 3. Request for Information.
  - 4. Electronic Data Request.
  - 5. Megger Grounding Test Certificate.
  - 6. Certification of Compliance for Building Materials.

**END OF SECTION**

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procedures.docx  
Last Updated: June 17, 2020*

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

SUBMITTAL NO.:

Architect's Project # 3431005

DATE: \_\_\_\_\_

DSA File/Apl. # XX-XX/XX-XXXXXX

Re-Submittal of Original No.: \_\_\_\_\_

**1. SUBMITTAL TRANSMITTAL**

Attention: Jennifer Huang

Contractor: Company

Contact: Name \_\_\_\_\_

Sub Contractor:

Contact: \_\_\_\_\_



**Please submit only one trade per submittal! Description of submitted materials:**

Quantity submitted	Specification Section		Description of contents (e.g. product data, shop drawings, samples)
	Section #	Section Title	

**Contractor Statement: (read and acknowledge)**

This submittal has been reviewed and approved with respect to the means, methods, techniques, and procedures of construction, safety precautions, and program incidentals thereto. This submittal complies with the contract documents and comprises no variations thereto, unless accompanied by a substitution request.

By: \_\_\_\_\_  
Name

Date: \_\_\_\_\_

**2. RE-TRANSMITTAL TO CONTRACTOR:**

Distribution: Contractor, Owner, Project Inspector, RGA, Other

- ☐ NO EXCEPTIONS TAKEN  
☐ SUBMIT SPECIFIED ITEM

- ☐ REJECTED  
☐ REVISE AND RESUBMIT

- ☐ FURNISH AS CORRECTED  
☐ NO ACTION REQUIRED

Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the Drawings and Specifications. This general check is only for the review of conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all the other trades, and performing his work in a safe and satisfactory manner.

**Rainforth Grau Architects**

By: \_\_\_\_\_ Date: \_\_\_\_\_

**Additional Comments:**

See Specification Section 01 3300 for use of this form

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

**SUBSTITUTION  
REQUEST NO.:**

Architect's Project # 3431005  
DSA File/Apl. # XX-XX/XX-XXXXXX

Date: \_\_\_\_\_

**1. SUBSTITUTION REQUEST**

Attention: Jennifer Huang

Contractor: Company \_\_\_\_\_

Contact: Name \_\_\_\_\_



***Please submit only one product per request!***

Sub Contractor: \_\_\_\_\_

***Include with a specified product Submittal***

Contact: \_\_\_\_\_

**2. PROPOSED SUBSTITUTIONS: The undersigned requests consideration of the following substitution:**

Specified Item: \_\_\_\_\_ Page No.: \_\_\_\_\_ Paragraph No.: \_\_\_\_\_

Proposed Item: \_\_\_\_\_

**3. REASON FOR REQUEST:**

**4. REQUIREMENTS FOR SUBSTITUTIONS:**

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified. Attached data also includes a description of changes to Contract Documents, which proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on drawings and does not require design changes in the Contract Documents.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on the work, the schedule or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the proposed substitution are equivalent or superior to the specified item.

Signature - Contractor/Subcontractor \_\_\_\_\_

Date \_\_\_\_\_

**5. TRANSMITTAL TO CONTRACTOR:**

Distribution: Contractor, Owner, Project Inspector, RGA, Other

☐ **ACCEPTED**

☐ **ACCEPTED AS NOTED**

☐ **REJECTED**

**Rainforth Grau Architects**

By: \_\_\_\_\_

Date: \_\_\_\_\_

**Comments:**

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

RFI NO.:

Architect's Project # 3431005  
DSA File/Apl. # XX-XX/XX-XXXXXX

Date: \_\_\_\_\_

---

**1. REQUEST FOR INFORMATION**

Attention: Jennifer Huang

From:

Contractor:

Company

Contact:

Name

Sub Contractor:

Contact:



---

**Identify related specific references within the Contract Documents and supporting information:**

Dwg./Document No.: \_\_\_\_\_

Building/Site Location: \_\_\_\_\_

---

**2. Existing Condition** (source / reason for the request):

---

**3. Recommended Contractor Action(s) for resolution:**

---

**4. Project Inspector Acknowledgment:**

Date Reviewed: \_\_\_\_\_

---

**5. Owner / A/E Resolution(s):**

Date of Response: \_\_\_\_\_ By: \_\_\_\_\_

---

*Attachments:* \_\_\_\_\_

*Extra Work Involved in the Above Described Change?*

Yes ☐

No ☐

Distribution: Contractor, Owner, Project Inspector, RGA, Other  
See Specification Section 01300 for use of this form

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

**E-DATA  
REQUEST NO.:**

Architect's Project # 3431005  
DSA File/Apl. # XX-XX/XX-XXXXXX

**Date:** \_\_\_\_\_

---

**1. ELECTRONIC DATA REQUEST**

Attention: Jennifer Huang

From: Contractor: Company

Contact: Name

Sub Contractor:

Contact: \_\_\_\_\_



---

**2. DATA REQUESTED - Provide list of specific drawings requested (include sheet numbers):**

---

**3. REASON FOR REQUEST - Provide clear explanation of why information is desired and for what purpose it will be utilized:**

---

**4. ACKNOWLEDGEMENT OF RESPONSIBILITY:**

The electronic data files requested are distributed for reference only. Transferring such files can alter, delete or change original information. Accuracy of the data cannot be guaranteed as correct or complete and the Contractor accepts full responsibility for any and all inaccuracies, regardless of cause.

The hard copy documents, including addenda and subsequent written changes to the documents, represent the complete work of the contract and all electronic files should be cross-referenced and verified from that information as electronic files may not contain all contract information. It is the Contractor's responsibility to make any changes or revisions necessary.

This electronic data is furnished without guarantee of compatibility with your hardware or software. It is the Contractor's responsibility to notify the Architect in the event a compatibility problem or disk defect is encountered and a replacement disk is necessary.

This electronic data, in its present form, remains the property of Rainforth Grau Architects and shall not be used for any other purpose than to provide background information for the project noted above. It is not to be released to any other party without the written consent of Rainforth Grau Architects.

Accepted by: \_\_\_\_\_  
Signature - Contractor/Subcontractor

Representing: \_\_\_\_\_  
Contractor/Subcontractor Company Name

### **MEGGER GROUNDING TEST CERTIFICATE**

This certifies that a Megger Grounding Test for the **Victor Elementary School - HVAC Replacement** for the **Lodi Unified** School District, of **San Joaquin** County, California was conducted on the \_\_\_\_\_ day of \_\_\_\_\_, **2023**, per CCR Title 24, Sections 200 H and J. The undersigned verifies that the resistance to ground was 25 ohms or less, as required, and is found to be acceptable.

Project Name: \_\_\_\_\_

DSA File No.: \_\_\_\_\_ DSA Application No.: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Contractor's Signature: \_\_\_\_\_

Electrical Contractor's Signature: \_\_\_\_\_

Testing Agency's Signature: \_\_\_\_\_

District Inspector's Signature: \_\_\_\_\_

**SEPARATE CERTIFICATE IS REQUIRED FOR EACH SITE**



### **CERTIFICATION OF COMPLIANCE FOR BUILDING MATERIALS**

This is to certify, in accordance with the Environmental Protection Agency requirements, that the materials and equipment used in the construction of the **Victor Elementary School - HVAC Replacement** for the **Lodi Unified** School District of **San Joaquin** County, California, are asbestos free and are, therefore, not subject to monitoring for asbestos contamination.

Project Name: \_\_\_\_\_

Address: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**SEPARATE CERTIFICATE IS REQUIRED FOR EACH SITE**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Alteration requirements for modernizations, remodels, and additions.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 1100, Summary of Work.
- B. Section 01 7329, Cutting and Patching.

### **1.3 REFERENCES AND STANDARDS**

- A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Contractor to coordinate and conduct a meeting with the demolition contractor to verify which systems, if any, are to be protected and maintained. Such systems shall be clearly identified and marked to avoid unnecessary damage or removal.
  - 2. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate Owner occupancy.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer and Installer Qualifications: As specified in the product specifications.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. Single Source Responsibility: Use materials and products of one manufacturer whenever possible.
- D. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

### **1.6 FIELD CONDITIONS**

- A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

**ALTERATION PROJECT PROCEDURES**  
**SECTION 01 3516**  
**3431005**

**PART 2 - PRODUCTS**

**2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK**

- A. New Materials: As specified in product Sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspection and testing products where necessary, referring to existing work as a standard.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that demolition is complete and areas are ready for installation of new work.
- B. Inspect conditions of uncovered work affecting installation of products or performance work.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. Beginning of restoration work means acceptance of existing conditions.
- E. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

**3.2 PREPARATION**

- A. Close openings in exterior surfaces to protect existing work and salvage items for weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.
- B. Cut, move or remove items as necessary for access to alterations and renovation work.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete.
- E. Prepare surface, and remove surface finishes to provide for proper installation of new work and finishes including blocking, framing, insulation, etc.
- F. Replace materials as specified for finished work.

**3.3 INSTALLATION**

- A. Complete Project in all respects including operational mechanical and electrical work.
- B. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition, and installation of concealed work, as specified in Section 01 7329, Cutting and Patching,

- C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- D. Install products as specified in individual specifications Sections.
- E. Where materials or equipment are removed, but no new finish is scheduled, patch and repair any damage to match existing wall surface.

### **3.4 TRANSITIONS**

- A. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work is to match existing adjacent work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural point of division and make recommendation to Architect.

### **3.5 ADJUSTMENTS**

- A. Where a change of plane of 1/8" or more occurs, submit recommendation for providing a smooth transition for Architect review.
- B. Fit work at penetrations of surfaces as specified in Section 01 7329.

### **3.6 FINISHES**

- A. Finish surfaces as specified in individual Product Sections.
- B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

### **3.7 REPAIR OF DAMAGED SURFACES**

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.
- C. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

### **3.8 CLEANING**

- A. Upon completion of installation, remove manufacturer's temporary labels and marks of identification. Thoroughly clean surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition.

### **3.9 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

**ALTERATION PROJECT PROCEDURES**  
**SECTION 01 3516**  
**3431005**

- B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

**END OF SECTION**

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procedures.docx  
Last Updated: December 16, 2021*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Special environmental, sustainable, and “green” building practices related to indoor air quality, resource efficiency supplementing the Pollutant Control requirements specified under Section 01 8113.10, Sustainable Design Requirements, and to ensure healthy indoor air quality in final Project.
- B. Contractor is required to comply with sustainable building practices during construction and when considering materials for substitutions. Refer to Article “Design Requirements.”

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions.
- B. Section 01 7419, Construction Waste Management and Disposal.
- C. Section 01 8113, Sustainable Design Requirements.
- D. Division 23, Mechanical General Conditions.
- E. Division 23, Packaged Air Conditioning Units.

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Sustainable Design Submittals shall comply with the additional requirement of Section 01 8113, Sustainable Design Requirements.
  - 3. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

### **1.4 DESIGN REQUIREMENTS**

- A. Owner has established general environmental goals for design and for construction of the Project.
  - 1. In addition to the Contractor, the Contractor’s construction team, including subcontractors, suppliers, and manufacturers, are encouraged to participate where possible to realize the Owner’s environmental goals.
  - 2. Intent is for environmental goals to be achieved in a manner which ultimately provides a safe and healthy environment for building occupants with minimal impact on the local, regional and global environment.
- B. Environmental Goals:

## **ENVIRONMENTAL PROCEDURES**

### **SECTION 01 3543**

**3431005**

1. Refer to specific Specifications Sections for more detailed construction requirements related to specific materials and systems.

#### **1.5 INFORMATIONAL SUBMITTALS**

##### **A. Indoor Air Quality (IAQ) Data:**

1. Environmental Issues: Submit emission test data produced by acceptable testing laboratory, listed in this Specification Article "Quality Assurance," for materials as required in each specific Specification Section.
  - a. Laboratory reports shall contain emissions test data on Volatile Organic Compounds (VOCs) including Total Volatile Organic Compounds (TVOC), specific individual VOCs, formaldehyde and other aldehydes as described in this Section.
  - b. Identify VOCs emitted by each material as required in these Specifications, and demonstrate compliance with the California Green Building Standards Code, edition current as of the date of this Contract.
  - c. Specific test conditions and requirements are set forth in the Specifications. For required tests, submit documentation of sample acquisition, handling, and test specimen preparation, as well as test conditions, methods, and procedures. The tests consist of a 10-day conditioning period followed by a 96-hour test period.
    - 1) Samples collected during the test period at 24, 48, and 96-hours shall be analyzed for TVOC and formaldehyde.
    - 2) VOC samples collected at 96 hours shall be identified and quantified for compounds that are found on the list of Chemicals of Concern. The Chemicals of Concern list is based on the California OEHHA list as of September 2002 (The most recent list shall be used for this Specification as published at:
      - a) [http://www.oehha.org/air/chronic\\_rels/allChrels.html](http://www.oehha.org/air/chronic_rels/allChrels.html).
2. Cleaning and Maintenance Products: Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products. These procedures are for final Contractor cleaning of the project prior to Substantial Completion and for provided materials and products as required by the specific Specification Sections.
  - a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1 percent of the total mass of the cleaning product is a carcinogen or reproductive toxicant as identified in the Chemicals of Concern list referenced above.
  - b. Avoid cleaning products containing alpha-pinene, d-limonene or other unsaturated carbon double bond alkenes due to chemical reactions with ozone to form aldehydes, acidic aerosols, and ultra-fine particulate matter in indoor air.

##### **B. Certificates:**

1. Prior to Final Completion, submit a certificate signed by corporate office holder of Contractor, subcontractor, supplier, vendor, installer or manufacturer primarily responsible for the manufacturing of the product, indicating materials provided are essentially the same, and contain essentially the same components as products and materials tested.
2. Comply with requirements specified in Specification Section 01 7700, Closeout Procedures.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Submit data relating to Environmental Issues.
  1. Submit environmental product certifications, in two forms:
    - a. Two CD-ROMs organized by CSI Division Format.
    - b. Three three-ring binders organized by CSI Division Format with Table of Contents and with dividers for each Division.

## **1.7 QUALITY ASSURANCE**

- A. Environmental Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for environmental issues compliance and coordination.
  1. Experience: Environmental project manager shall have experience relating to sustainable building construction.
  2. Responsibilities: Carefully review the Contract Documents for environmental issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
  3. Meetings: Discuss Environmental Goals at following meetings.
    - a. Pre-construction meeting.
    - b. Pre-installation meetings.
    - c. Regularly scheduled job-site meetings.
    - d. Special sustainability issues meetings.
- B. Environmental Issues Criteria: Comply with requirements listed in the Specification Sections.
- C. Acceptable Indoor Air Emissions Testing Laboratories:
  1. Selection of testing laboratories shall include assessment of prior experience in conducting indoor source emissions tests.
  2. The proposed laboratory shall be an independent company or organization not related to the manufacturer of the products to be tested.
  3. Submit documentation on proposed laboratory for review and approval by Owner.



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#### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.
  - 1. Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.
  - 2. Unacceptable Packaging Materials: Polyurethane, polyisocyanate, polystyrene, polyethylene, and similar plastic materials such as “foam” plastics and “shrink-fit” plastics.
  - 3. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by the manufacturers or suppliers for reuse where the reclamation program exists or where a program can be developed for such reuse.
  - 4. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling.
  - 5. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of the construction waste management recycling program, or return to the material’s manufacturer for use by the manufacturer or supplier.
  - 6. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to the supplier or manufacturer for reuse where such program is available.
- B. Comply with the additional requirements specified in Section 01 7419, Construction Waste Management and Disposal.

#### **1.9 FIELD CONDITIONS**

- A. No smoking will be permitted in indoor Project site locations, in accordance with California Labor Code (Section 400-6413.5).
- B. Environmental Product Certification:
  - 1. Include certification that indicates cleaning materials comply with requirements of these Specifications.
- C. Construction Ventilation and Preconditioning:
  - 1. Temporary Construction Ventilation: Maintain sufficient temporary ventilation of areas where materials are being used that emit VOCs. Maintain ventilation continuously during installation, and until emissions dissipate following installation. If continuous ventilation is not possible utilizing the building’s HVAC system(s) then ventilation shall be supplied using open windows and temporary fans, sufficient to provide no less than three air changes per hour.
    - a. Period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in these Specifications, a time period of 72 hours shall be used.
    - b. Ventilate areas directly to outside; ventilation to other enclosed areas is not acceptable.

2. During dust producing activities, including drywall installation and finishing, turn ventilation system off, and openings in supply and return HVAC system shall be protected from dust infiltration. Provide temporary ventilation as required.
3. Preconditioning: Prior to installation, allow products which have odors and significant VOC emissions to off-gas in dry, well-ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions prior to delivery to Project site and installation.
  - a. Condition products without containers and packaging to maximize off-gassing of VOCs
  - b. Condition products in ventilated warehouse or other building. Comply with substitution requirements for consideration of other locations.

D. Protection:

1. Moisture Stains: Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediately remove from site and properly dispose.
  - a. Take special care to prevent an accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products
  - b. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
  - c. Replace moldy materials with new, undamaged materials.
2. Ducts: Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside of ducts.

## **PART 2 - PRODUCTS**

### **2.1 SUBSTITUTIONS**

- A. Requests for substitutions shall comply with requirements specified in Specification Section 01 3300, Submittals, and with the following additional information required where environmental issues are specified:
  1. Indicate how each proposed substitution complies with requirements for VOCs.
  2. Owner, in consultation with Architect reserve the right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for the specified materials.
  3. Comply with the specified recycled content and other environmental requirements.

## **PART 3 - EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- A. Sequencing:

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1. On-Site Application: Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
  2. Complete interior finish material installation no less than 14 days prior to Substantial Completion to allow for Building Flush Out as described in Paragraph 3.1B.
- B. Building Flush Out: Just prior to Substantial Completion, flush out building air continuously using maximum tempered outside air, or maximum amount of outside air while achieving reasonable indoor temperature, for at least 14 calendar days. Continuously is defined as 24 hours per day, 7 days a week. If interruptions of more than a few hours are required for testing and balancing purposes, extend flush out period accordingly in order to achieve the minimum 14 calendar day building flush out period.
1. When Contractor is required to perform touch-up work, provide temporary construction ventilation during installation and extend building flush-out by a minimum of 4 calendar days after touch-up installation is complete with maximum tempered outside air for 24 hours per day.
  2. If construction schedule permits, extend flush-out period beyond minimum building flush out period for an additional 15 days.
  3. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

### **3.2 CLEANING**

- A. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces using cleaning and maintenance products that conform to standards as described in Part 1 of this Section.
- B. Clean equipment and fixtures to sanitary condition using cleaning and maintenance products that conform to standards as described in Part 1 of this Section.
- C. Products used for cleaning shall comply with Proposition 65 and the additional restrictions for volatile organic compounds specified in Section 01 6116.
- D. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.
- E. If ducts were not sealed during construction, and contain dust or dirt, clean ducts using HEPA vacuum immediately prior to Substantial Completion and prior to using ducts to circulate air. Oil film on sheet metal shall be removed before shipment to site. Ducts shall be inspected to confirm that no oil film is present. Remove oil film.
- F. Replace air filters, both pre and final filters, just prior to Substantial Completion.
- G. Remove and properly dispose of recyclable materials using construction waste management program described in Section 01 7419, Construction Waste Management and Disposal.

**3.3 PROTECTION**

- A. Protect interior materials from water intrusion or penetration where interior products are not intended for wet applications and are exposed to moisture.
- B. Protect installed products using methods that do not support growth of mold and mildew.
  - 1. Immediately remove from site materials with mold or mildew.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Standard reference abbreviations use in the Project Manual.
  - 2. Requirements for standard references use in the various Specification Sections.

### **1.2 STANDARD SPECIFICATIONS**

- A. The contract Documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections and tests published and issued by the organizations, societies, and associations. Such references are hereby made part of the Contract Documents to the extent required.
- B. When standard specifications are included by abbreviation and number only, it is assumed that the Contractor is familiar with and has ready access to the specified standards.
- C. When the effective date of a reference standard is not given, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of original issue of these Contract Documents, as indicated on the cover, shall govern the Work.
- D. Reference standards are not furnished with the contract Documents, because the Contractor, subcontractors, manufacturers, suppliers, and the trades involved are assumed to be familiar with their requirements
- E. Contractor shall obtain its own copies of required specified referenced publications.
- F. The specification or standard referred to shall have full force and effect as though printed in these specifications.
- G. In addition to those standards specifically referenced in the Specifications, comply with the accepted industry standards and trade association recommendations for the respective portions of Work.
- H. In the case of difference between referenced standards and the Contract Documents, the most stringent requirements prevail.

### **1.3 STANDARD SPECIFICATION ABBREVIATIONS**

- A. In addition to abbreviations indicated on the Drawings, references in the Project Manual to trade associations, technical societies, recognized authorities, and other institutions may include the following organizations, which are sometimes referred to by only the corresponding abbreviations. Not all abbreviations are listed, and not all listed abbreviations are used.
- B. Initialisms and Acronyms:

## **ABBREVIATIONS AND ACRONYMS**

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1.	AA	Aluminum Association
2.	AAMA	American Architectural Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	AATCC	American Association of Textile Chemists and Colorists
5.	ABAA	Air Barrier Association of America
6.	ACI	American Concrete Institute
7.	ACS	Access Compliance Section (DSA)
8.	ACSE	American Society of Civil Engineers
9.	ADA	American with Disabilities Act
10.	AGA	American Galvanizers Association
11.	AIA	American Insurance Association (successor to NBFU)
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AITC	American Institute of Timber Construction
15.	ALSC	American Lumber Standards Committee
16.	ANSI	American National Standards Institute
17.	APA	The Engineered Wood Association
18.	ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning
19.	ASTM	ASTM International
20.	AWI	Architectural Woodwork Institute
21.	AWPA	American Wood Protection Association
22.	AWS	American Welding Society
23.	BHMA	Builders Hardware Manufacturers Association
24.	CALGreen	California Green Building Standards Code
25.	CBC	California Building Code
26.	CEC	California Electrical Code
27.	CFC	California Fire Code
28.	CLFMI	Chain Link Fence Manufacturing Institute
29.	CMC	California Mechanical Code
30.	CPC	California Plumbing Code
31.	CRA	California Redwood Association
32.	CRI	Carpet and Rug Institute
33.	CRSI	Concrete Reinforcing Steel Institute
34.	CS	Commercial Standard of National Bureau of Standards (US Dept of Commerce)
35.	DHI	Door and Hardware Institute
36.	DSA	Division of the State Architect
37.	DTSC	Department of Toxic Substances Control
38.	EPA	Environmental Protection Agency
39.	FDA	U.S. Food and Drug Administration

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40.	FLS	Fire & Life Safety (DSA)
41.	FM	Factory Mutual
42.	FS	Federal Specification of General Services Administration
43.	FSC	Forest Stewardship Council
44.	GA	Gypsum Association
45.	HMMA	Hollow Metal Manufacturers Association
46.	ICC-ES	International Code Council Evaluation Service
47.	ISO	International Organization for Standards
48.	MIA	Masonry Institute of America
49.	MMPA	Moulding and Millwork Producers Association
50.	MPI	Master Painters Institute
51.	NAAMM	National Association of Architectural Metal Manufactures
52.	NAAWS	North American Architectural Woodwork Standards
53.	NBFU	National Board of Fire Underwriters (See AIA)
54.	NBHA	National Builders Hardware Association
55.	NEC	National Electric Code of NFPA
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association
58.	NFSHSA	National Federation of State High School Associations
59.	NRCA	National Roofing Contractors Association
60.	OSHA	Occupational Safety and Health Administration
61.	PCA	Portland Cement Association
62.	PCI	Precast Concrete Institute
63.	PI	Project Inspector
64.	PLIB	Pacific Lumber Inspection Bureau
65.	RIS	Redwood Inspection Service (Grading Rules)
66.	SCAQMD	South Coast Air Quality Management District
67.	SEI	Structural Engineering Institute
68.	SDI	Steel Door Institute
69.	SJI	Steel Joist Institute
70.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
71.	SMF	Office of the State Fire Marshal
72.	SPR	Simplified Practice Recommendation (US Dept. of Commerce)
73.	SSMA	Steel Stud Manufacturers Association
74.	SSPC	The society for Protective Coatings
75.	SWPPP	Storm Water Pollution Prevention Plan
76.	TCNA	Tile Council of North America
77.	Title 19	California Code of Regulations - Public Safety
78.	Title 24	California Code of Regulations - Building Codes
79.	TMS	The Masonry Institute

## **ABBREVIATIONS AND ACRONYMS**

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- |     |       |   |
|-----|-------|---|
| 80. | UL    | Underwriter's Laboratories, Inc.                        |
| 81. | WCLIB | West Coast Lumber Inspection Bureau (successor to WCLA) |
| 82. | WDMA  | Window and Door Manufacturers Association               |
| 83. | WI    | Woodwork Institute                                      |
| 84. | WRCLA | Western Red Cedar Lumber Association                    |
| 85. | WWPA  | Western Wood Products Association                       |

### **END OF SECTION**

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acronyms.docx*

*Last Updated: December 16, 2021*



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Definitions of terms and requirements pertaining to the contract documents,

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and other Division 1 Specification Sections, apply to work of this section.

### **1.3 DESCRIPTION OF REQUIREMENTS**

- A. General Explanation: A substantial amount of specification language consists of definitions for terms found in other contract documents, including the drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.) Certain terms used in contract documents are defined in this Section. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the Contract Documents.
- B. General Requirements: The provisions or requirements of Division 1 sections apply to entire work of Contract and, where so indicated, to other elements which are included in project.
- C. Governing Regulations: Refer to General for requirements related to compliance with governing regulations.
- D. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in sections at first instance of use. Trade association names and titles of general standards are frequently abbreviated.

### **1.4 DEFINITIONS**

- A. Approve: Where used in conjunction with Architect's/ Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.
- B. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and

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"permitted" mean "directed by Architect", "requested by Architect", and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

- C. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, unloaded, ready for assembly, installation, etc., as applicable in each instance. See Also "Provide".
- D. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specification, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- E. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance. See also "Provide".
- F. Installer: The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in the operations they are engaged to perform.
- G. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to Architect for decision before proceeding.
- H. Project Site: The term "project site" is defined as the space available to the Contractor for performance of the work, either exclusively of or in conjunction with others performing other work as part of the project. The extent of the project site is shown on the drawings, and may or may not be identical with the description of the land upon which the project is to be built.
- I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
- J. Specialists, Assignments: In certain instances, specification test requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; they are also not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended

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to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

- K. Testing Laboratory: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.
- L. Trades: Except as otherwise indicated, the use of titles, such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

**1.5 DRAWING SYMBOLS:**

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

**1.6 INDUSTRY STANDARDS:**

- A. General Applicability of Standards: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, applicable standards of the construction industry have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herewith. Refer to other contract documents for resolution of overlapping and conflicting requirements which result from the application of several different industry standards to the same unit of work. Refer to individual unit of work sections for indications of which specialized codes and standards the Contractor must keep at the project site, available for reference.
- B. Referenced Standards (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.
- C. Non-referenced Standards are hereby defined as having no particular applicability to the work, except as a general requirement of whether the work complies with standards recognized in the construction industry.
- D. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.

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- E. Copies of Standards: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.
1. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
  2. Although a certain number of copies of these standards may be required as a part of the submittal, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.
- F. Acronyms: Where acronyms are used in the specifications or other contract documents they are defined to mean the industry recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the test provision.

**1.7 GOVERNING REGULATIONS/AUTHORITIES**

- A. General: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the work.
- B. "Regulations" is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

**1.8 SUBMITTALS**

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipt for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Administrative and procedural requirements related to inspections, tests, and related quality control procedures required to be performed by the Contractor and that facilitate the Contractor's compliance with the Contract Documents.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3300, Submittal Procedures; submission of manufacturers' instructions and certificates.
- B. Section 01 4523, Testing and Inspecting Services, and DSA 103; Special Tests and Inspections required by authorities having jurisdiction and are the responsibility of Owner.
- C. Section 01 7700, Closeout Procedures.
- D. Specific requirements for testing, inspections, mockups, and other quality control requirements as described in the various Sections of the Specifications.

### **1.3 DEFINITIONS**

- A. Experienced: When used with an entity or individual, and unless otherwise specified, means having successfully completed a minimum of three previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
- D. Tests: Procedures intended to establish the quality, performance, or reliability of a product or system conducted by a qualified Testing Agency.
- E. Source Quality-Control Tests: Tests and inspections related to materials manufactured or fabricated away from the jobsite that will be incorporated into the work.
- F. Testing Agency: An independent entity engaged to perform specific tests, inspections, or both, is qualified to operate in California, and meets the additional requirements specified.
  - 1. Testing laboratory shall mean the same as Testing Agency.

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- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include Contract administration activities performed by Architect.

**1.4 REFERENCES AND STANDARD SPECIFICATIONS**

- A. General:
  - 1. The Contract Documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections, and tests published and issued by the organizations, societies, and associations.
  - 2. Contractor shall obtain its own copies of required specified referenced publications.
  - 3. The specification or standard referred to shall have full force and effect as though printed in these Specifications.
  - 4. When the effective date of a reference standard is not specified, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of the DSA approval, shall govern the Work.
  - 5. The contractual relationships, duties, and responsibilities of the parties in Contract or those of the Architect shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- B. Products or workmanship specified by association, trade, or other consensus standards shall comply with requirements of the referenced standard or specification except when more rigid requirements are specified or are required by applicable codes.
- C. Conflicting Requirements:
  - 1. If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement.
  - 2. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

**1.5 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Schedule of Tests and Inspections.
- B. Field Superintendent's Quality Control Responsibilities
- C. Procedures for inspection prior to subsequent Work or cover up.
- D. Qualifications of Contractor's Testing Agencies.
- E. Certified copies of Reports and Documents.

**1.7 CLOSEOUT SUBMITTALS**

- A. Permits, Licenses, and Certificates: Copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.
- B. Test and Inspection Log including final record for each test and inspection as specified in Part 3 and in accordance with Section 01 7839, Project Record Documents.

**1.8 REPORTS AND DOCUMENTS**

- A. Test and Inspection Reports: Prepare and submit certified written reports where specified in the Specification Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and re-inspecting.

**1.9 QUALITY ASSURANCE**

- A. Minimum Quantity or Quality Levels:

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1. The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.
  2. Refer uncertainties to Architect for a decision before proceeding.
- B. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- C. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- D. Correct conditions or workmanship not in conformance with specified standards or quality. Do so immediately after non-conformance item is discovered or within a reasonable time frame agreed upon with Construction Manager.
- E. Comply with manufacturers' instructions, including each step in sequence. Should manufacturers' instructions conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. Comply with specified standards as minimum quality for the Work, except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- G. Perform Work by persons qualified to produce required and specified quality.
- H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- I. Upon delivery to the jobsite, materials and products shall be inspected for compliance with the Project Specifications.
1. Nonconforming materials, products, equipment, hardware, tools and/or safety devices shall be removed immediately from the general work area and stored within a secured area approved by the Owner as "NON CONFORMING MATERIALS AREA" to ensure that defective or nonconforming materials are not incorporated into or used on the project
  2. Materials or products shall not be removed from the designated area until they are deemed by the Architect to be in compliance, or until they are modified or fixed to meet the project specifications, or until they are removed from the jobsite for the purposes of disposal or shipment back to the manufacturer.

**1.10 CONTRACTORS TESTING AGENCY**

- A. Qualifications: At Contractor's expense, provide an independent testing laboratory nationally recognized according to 29 CFR 1910.7 and accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP,) or other independent agency with the experience and capability to conduct testing and inspecting indicated,



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documented according to ASTM E329; with additional qualifications specified in individual Sections; and, where required, that is acceptable to authorities having jurisdiction.

- B. Testing Agency shall cooperate with Architect, Owner's Project Inspector, and Contractor in performance of duties.
- C. Testing Agency shall provide qualified personnel to perform required tests and inspections.
- D. Testing Agency shall not be authorized to release, revoke, alter, or increase the Contract Document requirements, approve or accept any portion of the Work, or perform any duties of Contractor.

**1.11 TESTS AND INSPECTIONS**

- A. Preconstruction Testing: Where preconstruction testing is specified to verify performance requirements, comply with the following as applicable:
  - 1. Contractor Responsibilities:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project unless approved by Architect in writing.
- B. Tests and Inspections indicated in individual Specification Sections shall be conducted by a qualified Testing Agency. The responsibilities of the Testing Agency shall be as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect, Owner's Project Inspector, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submit a certified written report of each test, inspection, and similar quality-control service to Architect and Owner's Project Inspector with copy to Contractor and to DSA.

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4. Submit a final report of tests and inspections at Substantial Completion which includes a list of unresolved deficiencies.
  5. Interpret tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retest and reinspect corrected work.
- C. Monitoring and Documentation: Contractor shall maintain testing and inspection reports including log of approved and rejected results as specified in Part 3.
1. Include work Architect has indicated as nonconforming or defective.
  2. Indicate corrective actions taken to bring nonconforming work into compliance with requirements.
  3. Comply with requirements of the California Division of the State Architect (DSA).

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 NOTIFICATIONS**

- A. Contractor shall provide the following notifications;
1. Owner's Project Inspector writing:
    - a. 24 hours in advance of starting new Work
    - b. 24 hours in advance of each test or inspection
  2. 48 hours' prior notice, minimum, to the Testing Agency for required tests and inspections.

**3.2 TEST AND INSPECTION FIELD BINDER**

- A. Contractor shall maintain in the Field Office a Test and Inspection Field Binder that includes a hard copy of the following documents:
1. Approved Quality Control Plan.
  2. Specification Sections that apply to the respective portions of work.
  3. RFI's, CCD's or other approved document that changes the work.
  4. Manufacturer's Installation Instructions (MII).
  5. Specific details of the Work as requested by the Inspector.
  6. Test and Inspection Log.

**3.3 TEST AND INSPECTION LOG**

- A. Prepare and maintain a record of tests and inspections using an electronic spreadsheet.
- B. Include the following information:

1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. List pertinent detail/sheet number.
  4. List pertinent Specification Section.
  5. Attach manufacturer's installation inspections if applicable.
  6. List and attach RFI's, ASI's or CCD's affecting the Work.
  7. Date Inspector verified work is acceptable.
- C. Final record for each test and inspection shall be submitted on Contractors letterhead and include the name of the responsible person to verify Work was in accordance with the approved Contract Documents.

### **3.4 MANUFACTURERS' FIELD SERVICES**

- A. When specified in respective Specification Sections, Contractor shall require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting and balancing of equipment as applicable, and to make appropriate recommendations. Contractor is responsible for proper notification of manufacturer's representative before installation of applicable work and for obtaining necessary inspection certificate stating that installation was observed and approved.
- B. Product Performance Verification: The supplier of products specified based on performance criteria shall, at the request of the Agency, inspect the installed product and certify conformance of the product to specified criteria under the installed conditions.
- C. Manufacturer's representative shall submit written report to the Architect listing observations and recommendations.

### **3.5 TOLERANCES - GENERAL**

- A. Monitor tolerance control of installed products or portions to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.6 DIMENSIONING AND TOLERANCES FOR ACCESSIBILITY**

- A. While it is recognized that construction practices generally permit a level of reasonable dimensional tolerance, the installation of items subject to compliance with the Americans with Disabilities Act Accessibility Guidelines and Chapter 11B of the California Building Code, typically does not allow such tolerances. Therefore, these dimensions are to be considered absolute and will be strictly enforced. Items found to be out of tolerance may require modification and/or replacement at Contractor's expense.

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**3.7 REPAIR AND PROTECTION**

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes.
  - 2. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7329, Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**

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*Last Updated: August 28, 2020*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for Testing Laboratory.
  - 2. Contractor's responsibilities for facilitation of Testing and Inspections.

### **1.2 RELATED SECTIONS AND DOCUMENTS**

- A. DSA 103 - Structural Test & Inspections List.
- B. Division 23, Mechanical Work - Testing, adjusting, and balancing of systems.
- C. Individual Specification Sections: Inspections and tests required, and standards for testing.

### **1.3 REFERENCES**

- A. California Administrative Code (CAC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 SELECTION AND PAYMENT**

- A. Testing laboratory shall be approved by both the Architect and the Division of the State Architect.
- B. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing. Retesting costs for failed tests will be the Contractors responsibility and will be back-charged against the contract.
- C. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

### **1.5 LABORATORY REPORTS**

- A. After each inspection and test, promptly submit two copies of laboratory report to Owner, Architect, Contractor and DSA.
- B. Include:
  - 1. Date of issue,
  - 2. DSA Application and File numbers,
  - 3. Project title and number,
  - 4. Name of inspector,

## **TESTING AND INSPECTION SERVICES**

### **SECTION 01 4523**

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5. Date and time of sampling or inspection,
6. Identification of product and Specification Section,
7. Location in the Project,
8. Type of inspection or test,
9. Date of test,
10. Results of test,
11. Conformance with Contract Documents.

C. When requested by Architect, provide interpretation of test results.

#### **1.6 LIMITS ON TESTING LABORATORY AUTHORITY**

- A. Laboratory may not release, revoke, alter or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop the work.

#### **1.7 CONTRACTOR RESPONSIBILITIES**

- A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs. Allow reasonable time for review and testing.
- B. Arrange for, and coordinate with, laboratory for all required testing and inspection. Provide adequate notice, in advance, for proper scheduling and processing of testing. The Inspector will not be responsible for scheduling or arranging for testing and inspection services.
- C. Cooperate with laboratory personnel, and provide access to the work and to manufacturer's facilities.
- D. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at the source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- E. Notify Architect, Inspector, Structural Engineer (when applicable) and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

**END OF SECTION**

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*Last Updated: December 16, 2021*

**DSA-103**

Issued 9/1/2017

## List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

School Name		District	
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**IMPORTANT:** This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.

**NOTE:** This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

**INSTRUCTIONS:** Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected. **For more information on use of this form, see DSA-103.INSTR.**

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE <sup>1</sup>	PERFORMED BY <sup>2</sup>	CODE REFERENCE AND NOTES
+	SOILS			
+	CONCRETE			Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13
+	MASONRY			TMS 402-13/ACI 530-13/ASCE 5-13 Table 3.1.3 & TMS 602-13/ACI 530.1-13/ASCE 6-13 Table 5
+	STEEL, ALUMINUM			Table 1705A.2.1, AISC 303-10, AISC 360-10, AISC 341-10, AISC 358-10, AISI S100-07/S2-10
+	WOOD			
+	OTHER			

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# **List of Required Structural Tests & Special Inspections - 2016 CBC**

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

**List of required verified report(s):**
**KEY to Columns**

1 Type -	2 Performed By -
<b>Continuous</b> – Indicates that a continuous special inspection is required	<b>GE</b> – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
<b>Periodic</b> – Indicates that a periodic special inspection is required	<b>LOR</b> – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
<b>Test</b> – Indicates that a test is required	<b>SI</b> – Indicates that the special inspection is to be performed by a special inspector

 Name of Architect or Engineer in general responsible charge
   


 Name of Structural Engineer (When structural design has been delegated)
   


 Signature of Architect or Structural Engineer
   


 date
   


 IDENTIFICATION STAMP  
 DIV OF THE STATE ARCHITECT  
 APP. #

 AC N/A F/LS N/A SS       

 DATE                     
**Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing**



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# List of Required Structural Tests & Special Inspections - 2016 CBC

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Revised:

Revised:

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.	
	<b>Soils:</b>
X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
	<b>Concrete/Masonry:</b>
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.
X	4. Epoxy shear dowels in site flatwork.

Exempted by Design Prof.	
	<b>Welding:</b>
X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) <= 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.
(Optional) List details for applicable exempt items:	



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# List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

(Optional) List details for applicable exempt items:

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes general requirements that apply to implementation of the California Energy Code-required acceptance testing without regard to specific systems, assemblies, or components.
- B. Related Sections:
  - 1. Division 01 Section "Facilities Exterior Enclosure Commissioning" for commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.
  - 2. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
  - 3. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
  - 4. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.

### **1.2 ACCEPTANCE TESTING TEAM**

- A. Members Appointed by Contractor: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the acceptance testing process through coordinated action. The acceptance testing team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors.
- B. Members Appointed by Owner:
  - 1. Acceptance Testing Agency: The designated company that plans, schedules, and coordinates the acceptance testing team to implement the acceptance testing process. Owner will engage the acceptance testing agency under a separate contract. All individuals that perform testing from the Acceptance Testing Agency on the project site shall be a certified Acceptance Test Technician (ATT).
    - a. A listing of certified ATT is available at: <https://www.energy.ca.gov/programs-and-topics/ptograms/acceptance-test-technician-certification-provider-program/acceptance> .

### **1.3 CONTRACTOR'S RESPONSIBILITIES**

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform acceptance testing activities including, but not limited to, the following:

## **ENERGY CODE - REQUIRED ACCEPTANCE TESTING**

### **SECTION 01 4533.13**

#### **3431005**

1. Evaluate performance deficiencies identified in acceptance testing reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the acceptance testing agency for resolution of issues.
3. Participate in acceptance testing meetings.
4. Integrate and coordinate acceptance testing process activities with construction schedule.
5. Provide acceptance testing agency with information required to complete checklists.
6. Review and accept checklists provided by the acceptance testing agency.
7. Review and accept test procedures provided by the acceptance testing agency.
8. Complete acceptance testing process test procedures as required by acceptance testing agency.

#### **1.4 ACCEPTANCE TESTING AGENCY RESPONSIBILITIES**

- A. Convene acceptance testing meetings.
- B. Provide Project-specific acceptance testing checklists and procedures.
- C. Prepare and maintain completed checklist log.
- D. Provide Project Inspectors the forms to confirm the required Acceptance Tests have been completed. Final certificate of occupancy cannot be issued until all certificates of acceptance forms are received by the Project Inspector.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

#### **END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: VOC restrictions for product categories listed below under Article "DEFINITIONS" and in compliance with the following.
  - 1. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code.
- B. Products of each category that are installed in the project must comply; applicable laws and ordinances do not allow for partial compliance.
- C. Listing of a product in these Specifications shall not be construed as a solicitation or requirement to use any product or combination of products in violation of the requirements of South Coast Air Quality Management District Rule No.1168, as described in Rule 1168(g).
  - 1. If a listed product does not meet the requirements of this rule, request approval for use of an alternate product by the same or another manufacturer meeting the requirements of this rule.
  - 2. Do not use products which do not meet the requirements of this rule.

### **1.2 RELATED REQUIREMENTS**

- A. Divisions 01 through 33 contain related requirements specific to the work of each of these Sections. Requirements may or may not include reference to this Section.
- B. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.

### **1.3 REFERENCES**

- A. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at [www.chps.net/](http://www.chps.net/).

### **1.4 DEFINITIONS**

- A. VOC-Restricted Products: Products of each of the following categories when installed or applied on-site:
  - 1. Adhesives, sealants, and sealer coatings, regardless of specification Section or Division.
- B. Adhesives: Gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not.

## **VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**

### **SECTION 01 6116.10**

**3431005**

- C. Sealants: Gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

#### **1.5 SUBMITTAL REQUIREMENTS**

- A. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
- B. Verification of Compliance: Submit for each different product in each applicable category.
  - 1. Identify evidence submittals with the words "CALGreen VOC Compliance Report".
- C. Installer Certifications for Accessory Materials:
  - 1. Require each installer of any type of product, not just the products for which VOC restrictions are specified, to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of their products, or 2) that such products used comply with these requirements.
  - 2. Use the form following at the end of Part 3 in this Section for Installer certifications.

#### **1.6 QUALITY ASSURANCE**

- A. Manufacturer's Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this Section.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General:
  - 1. Provide products conforming to local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application. If specified product exceeds current requirement, provide conforming product at no additional cost.
  - 2. Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168 and less where required by code.
  - 3. Products are specified in multiple Sections throughout these Specifications.
- B. Composite Wood Products: Comply with CALGreen Section 5.504 and Table 5.504.4.5 formaldehyde limits for hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior and exterior of the building.
  - 1. Verification of Compliance: Acceptable types are:
    - a. Certification by manufacturer that product complies with requirements.
    - b. Published product data showing compliance with requirements.

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
**SECTION 01 6116.10**  
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- c. Chain of custody certifications.
- d. Product labeled and invoiced as meeting the Composite Wood Products regulation (CCR, Title 17, Section 93120, et seq.).
- e. Products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269, or European 636 3S standards.
- f. Other method acceptable to enforcing agency.

<b>Table 5.504.4.5 FORMALDEHYDE LIMITS</b>	
<b>Maximum Formaldehyde Emissions in Parts per Million</b>	
<b>Product</b>	<b>Current Limit</b>
Hardwood plywood veneer core	0.05
Hardwood plywood composite core	0.05
Particleboard	0.09
Medium density fiberboard	0.11
Thin medium density fiberboard <sup>1</sup>	0.13
Note 1: Thin medium density fiberboard has a maximum thickness of 5/16 inch (8 mm).	

- C. Insulation: Comply with CALGreen Section 5.504.4.8.2 formaldehyde limits for insulation.
  - 1. Verification of Compliance: Documentation from manufacturer verifying thermal insulation materials meet the pollutant emission limits of one of the following.
    - a. The VOC-emission limits defined in 2014 CACHPS criteria and listed on its High Performance Products Database.
    - b. California Department of Public Health 2010 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010 (also known as Specification 01350.)
- D. Adhesives, Including Carpet and Cushion Adhesives: Comply with CALGreen Section 5.504 and Table 5.504.4.1.
  - 1. Verification of Compliance: Acceptable types are:
    - a. Report of laboratory testing performed in accordance with requirements.
    - b. Published product data showing compliance with requirements.
    - c. Certification by manufacturer that product complies with requirements.
  - 2. Aerosol Adhesives: Comply with Table 5.504.4.1 of CalGreen Section 5.504, and California Code of Regulations Title 17, Section 94507.
    - a. Verification of Compliance: Acceptable types are:
      - 1) Current GreenSeal Certification.
      - 2) Report of laboratory testing performed in accordance with GreenSeal GS-36 requirements.

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
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3) Published product data showing compliance with requirements.

3. Products used shall comply with the following limits.

<b>Table 5.504.4.1 ADHESIVE VOC LIMIT</b>	
<b>Architectural Applications</b>	<b>Current VOC Limit</b>
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Outdoor Carpet Adhesives	150
Wood Flooring Adhesive	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Single Ply Roof Membrane Adhesives	250
Other adhesives not specifically listed	250
<b>VOC Limits and Effective Dates**</b>	
<b>Specialty Applications</b>	<b>Current VOC Limit</b>
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic Cement Welding	250
Adhesive Primer for Plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Top and Trim Adhesive	250
** The specified limits remain in effect unless revised limits are listed in the current governing edition of CalGreen.	
For adhesives, adhesive bonding primers, or any other primer not regulated by the above two Tables and applied to the following substrates, the following limits shall apply:	
<b>Substrate Specific Applications</b>	<b>Current VOC Limit</b>
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass 80	80
Note: If an adhesive is used to bond dissimilar substrates together the adhesive with the highest VOC content shall be allowed.	



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E. Joint Sealants: Comply with CALGreen Section 5.504 and Table 5.504.4.2.

1. Verification of Compliance: Acceptable types are:
  - a. Report of laboratory testing performed in accordance with requirements.
  - b. Published product data showing compliance with requirements.
  - c. Certification by manufacturer that product complies with requirements.
2. Products used shall comply with the following limits.

<b>Table 5.504.4.2 SEALANT VOC LIMIT</b>	
Less Water and Less Exempt Compounds in Grams per Liter	
Sealant	Current VOC Limit
Architectural	250
Marine Deck	760
Non-Membrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other	420
Sealant Primers	Current VOC Limit
Architectural	250 775
Non-Porous	
Porous	775
Modified Bituminous	500
Marine Deck	760
Other	750
For low-solid adhesives or sealants the VOC limit is expressed in grams per liter of material; for all other adhesives and sealants, VOC limits are expressed as grams of VOC per liter of adhesive or sealant less water and less exempt compounds.	

3. Restricted Components: In addition to the specified VOC limits, paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.

## **VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**

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- n. Formaldehyde.
- o. Hexavalent chromium.
- p. Isophorone.
- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

## **PART 3 - EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality, including fines by authorities, due to installation of non-compliant products shall be borne by Contractor.

### **3.2 CERTIFICATION FORM**

- A. Use of this Form:
  - 1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
  - 2. Contractor is required to obtain and submit this Form from each installer of work on this project.
  - 3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
  - 4. If these accessory materials have been used, attach to this form product data and MSDS sheet for each such product.

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**ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM**

IDENTIFICATION:

Project Name: \_\_\_\_\_

Project No.: \_\_\_\_\_

Architect: \_\_\_\_\_

PRODUCT CERTIFICATION: I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

Product data and MSDS sheets are attached.

CERTIFIED BY (Installer/Manufacturer/Supplier Firm):

Firm Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_ (officer of company)

Date: \_\_\_\_\_

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
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**END OF SECTION**

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compound (voc) restrictions.docx  
Last Updated: January 18, 2022*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Cutting and patching:
    - a. For construction that is defective, or as required to install incomplete work shown in the Contract Documents.
    - b. To extend work or restore existing construction to its original condition, unless otherwise specified or shown on the drawings.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.
- B. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.
- C. Section 01 3516, Alteration Project Procedures.

### **1.3 REFERENCES**

- A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 ADMINISTRATION REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

### **1.5 ACTION SUBMITTALS**

- A. Manufacturer's Data: For products not included in the specifications, submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, and installation instructions.
- B. Samples: As requested by the Architect.

**CUTTING AND PATCHING**  
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C. Request for Cutting and Patching:

1. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
  - a. Work of the Owner or any separate contractor.
  - b. Structural value or integrity of any element of the Project.
  - c. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
  - d. Efficiency, operational life, maintenance or safety of operational elements.
  - e. Visual qualities of sight-exposed elements.
  - f. No cutting of structural elements is allowed unless shown on the Division of the State Architect's approved drawings
2. Request shall include:
  - a. Project identification.
  - b. Description of affected work.
  - c. Necessity for cutting, alteration or excavation.
  - d. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
  - e. Description of proposed work:
    - 1) Scope of cutting, patching, alteration, or excavation.
    - 2) Trades who will execute the work.
    - 3) Products proposed to be used.
    - 4) Extent of refinishing to be done.
  - f. Alternatives to cutting and patching.
  - g. Cost proposal, when applicable.
  - h. Written permission of any separate contractor whose work will be affected.

D. Should conditions of work or schedule indicate change of products from original installation, Contractor shall submit request for substitution.

E. Submit written notice to Architect designating date and time work will be uncovered.

**1.6 INFORMATIONAL SUBMITTALS**

A. Sample of manufacturer's warranty, where applicable.

B. Sustainable Design:

1. General:
  - a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
  - b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
  - a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

**1.7 CLOSEOUT SUBMITTALS**

- A. Warranty/Guarantee: Submit executed warranties and Subcontractors' guarantees for products not included in the specifications.

**1.8 QUALITY ASSURANCE**

- A. Qualifications for Installers:
  - 1. General: As specified in the product specifications.
  - 2. Employ specially qualified installers or fabricators to perform cutting and patching for:
    - a. Weather-exposed or moisture-resistant elements.
    - b. Sight-exposed finished surfaces.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. Single-Source Responsibility: Use materials and products of one manufacturer whenever possible.
- D. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

**1.9 FIELD CONDITIONS**

- A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

**1.10 WARRANTY**

- A. Manufacturer: In addition to the Contractor's and Subcontractor's Guarantee, furnish Owner with manufacturers' available fully executed written warranties for products not included in the specifications against defects in materials and workmanship

**PART 2 - PRODUCTS**

**2.1 DESIGN AND PERFORMANCE CRITERIA**

- A. Sustainable Design:
  - 1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.

**2.2 MATERIALS**

- A. Comply with these specifications, standards and manufacturer's recommendations for each specific product involved.

**CUTTING AND PATCHING**  
**SECTION 01 7329**  
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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Inspect conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

**3.2 PREPARATION**

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of Project which may be exposed by cutting and patching work, and maintain excavations free from water.

**3.3 INSTALLATION**

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
  - 1. Removal or cutting of concrete paving shall occur at adjacent expansion joint or control joint.
- B. Execute fitting and adjustment of products to provide finished installation to comply with specified products, functions, tolerances and finishes.
- C. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
- D. Fit work airtight to pipe, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish entire unit.

**3.4 CLEANING AND ADJUSTING**

- A. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.



**CUTTING AND PATCHING**  
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- B. Upon completion of installation, thoroughly wash surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition.

**3.5 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

**END OF SECTION**

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*Last Updated: December 16, 2021*

**SECTION 01 7419A**  
**CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN**  
*(Submit After Award of Contract and Prior to Start of Work)*

<b>Project Title:</b>		
<b>Contract or Work Order No.:</b>		
<b>Contractor's Name:</b>		
<b>Street Address:</b>		
<b>City:</b>	<b>State:</b>	<b>Zip:</b>
<b>Phone: ( )</b>	<b>Fax: ( )</b>	
<b>E-Mail Address:</b>		
<b>Prepared by: (Print Name)</b>		

<b>Date Submitted:</b>		
<b>Project Period:</b>	<b>From:</b>	<b>TO:</b>

**Reuse, Recycling or Disposal Processes To Be Used**

*Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:*

- 01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)
- 02 - Salvaging building materials or salvage items at an off site salvage or re-use center (i.e. lighting, fixtures)
- 03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)
- 04 - Recycling source separated materials at an off site recycling center (i.e. scrap metal or green matls)
- 05 - Recycling commingled loads of C&D matls at an off site mixed debris recycling center or transfer station
- 06 - Recycling material as Alternative Daily Cover at landfills
- 07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
- 08 - Disposal at a landfill or transfer station.
- 09 - Other (please describe) \_\_\_\_\_

**Types of Material To Be Generated**

*Use these codes to indicate the types of material that will be generated on the project*

A = Asphalt	C = Concrete	M = Metals	I = Mixed Inert	G = Green Matls
D = Drywall	P/C=Paper/Cardboard	W/C = Wire/Cable	S= Soils (Non Hazardous)	
M/C = Miscellaneous Construction Debris	R = Reuse/Salvage	W = Wood	O = Other (describe)	

Facilities Used: Provide Name of Facility and Location (City)

Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period

Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).

**SECTION I - RE-USED/RECYCLED MATERIALS**

*Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.*

Type of	Type	Facility to be	Total Truck	Total Quantities		
Material	of Activity	Used/Location	Loads	Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
<b>a. Total Diversion</b>			0	0	0	0

SECTION 01 7419A  
CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN  
Continued

SECTION II - DISPOSED MATERIALS							
<i>Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.</i>							
Type of Material	Type of Activity	Facility to be Used/Location		Total Truck Loads	Total Quantities		
					Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles		2	35		
b. Total Disposal					0	0	0

SECTION III - TOTAL MATERIALS GENERATED						
<i>This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)</i>						
				Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled				0	0	0
b. Total Disposed				0	0	0
c. Total Generated				0	0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
<i>Add totals from Section I + Section II</i>						
		Tons	Cubic Yards	Other Wt.		
a. Materials Re-Used and Recycled		0				
b. Materials Disposed		0				
c. Total Materials Generated (a. + b. = c.)		0	0	0		
d. Landfill Diversion Rate (Tons Only)*		#DIV/0!				

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):						

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)

Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)

Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

Drywall Scrap: .20

Wood Scrap: .16

SECTION 01 7419B  
CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT  
(Submit With Each Progress Payment)

Project Title:		
Contract or Work Order No.:		
Contractor's Name:		
Street Address:		
City:	State:	Zip:
Phone: ( )	Fax: ( )	
E-Mail Address:		
Prepared by: (Print Name)		

Date Submitted:		
Period Covered:	From:	To:

**Reuse, Recycling or Disposal Processes Used**

*Describe the types of recycling processes or disposal activities used for material generated in the project. Indicate the type of process or activity by number, types of materials, and quantities that were recycled or disposed in the sections below:*

- 01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)
- 02 - Salvaging building materials or salvage items at an off site salvage or re-use center (i.e. lighting, fixtures)
- 03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)
- 04 - Recycling source separated materials at an off site recycling center (i.e. scrap metal or green matls)
- 05 - Recycling commingled loads of C&D matls at an off site mixed debris recycling center or transfer station
- 06 - Recycling material as Alternative Daily Cover at landfills
- 07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
- 08 - Disposal at a landfill or transfer station.
- 09 - Other (please describe) \_\_\_\_\_

**Types of Material Generated**

*Use these codes to indicate the types of material that were generated on the project*

A = Asphalt	C = Concrete	M = Metals	I = Mixed Inert	G = Green Matls
D = Drywall	P/C=Paper/Cardboard	W/C = Wire/Cable	S= Soils (Non Hazardous)	
M/C = Miscellaneous Construction Debris	R = Reuse/Salvage	W = Wood	O = Other (describe)	

Facilities Used: Provide Name of Facility and Location (City)

Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period

Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).

**SECTION I - RE-USED/RECYCLED MATERIALS**

*Include all recycling activities for source separated or mixed material recycling centers where recycling occurred.*

Type of Material	Type of Activity	Facilities Used/Location	Total Truck Loads	Total Quantities		
(ex.) M	04	ABC Metals, Los Angeles	24	Tons	Cubic YD	Other Wt.
a. Total Diversion			0	0	0	0

[PROJECT TITLE]  
[DATE]

Contractor's Reuse, Recycling, and Disposal Report  
Section 01 7419B-1

SECTION 01 7419B  
CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT  
Continued

SECTION II - DISPOSED MATERIALS						
<i>Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling occurred.</i>						
Type of Material	Type of Activity	Facilities Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal				0	0	0

SECTION III - TOTAL MATERIALS GENERATED						
<i>This section calculates the total materials generated during the project period (Reuse/Recycle + Disposal = Generation)</i>						
				Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled				0	0	0
b. Total Disposed				0	0	0
c. Total Generated				0	0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
<i>Add totals from Section I + Section II</i>						
	Tons	Cubic Yards	Other Wt.			
a. Materials Re-Used and Recycled	0					
b. Materials Disposed	0					
c. Total Materials Generated (a. + b. = c.)	0	0	0			
d. Landfill Diversion Rate (Tons Only)*	#DIV/0!					

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments ( <i>Provide any additional information pertinent to planned reuse, recycling, or disposal activities</i> ):						

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)

Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)

Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

Drywall Scrap: .20

Wood Scrap: .16

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes: Requirements and procedures for ensuring optimal diversion of construction waste materials generated by the Work from landfill disposal within the limits of the Construction Schedule and Contract Sum.
  - 1. The Work of this Contract requires that a minimum of 65% by weight of the construction and demolition materials generated in the Work is diverted from landfill disposal through a combination of re-use and recycling activities.
  - 2. CAL-Green: Alternate waste reduction methods developed in cooperation with local agencies if diversion or recycle facilities capable of compliance with CAL-Green requirements do not exist within the haul boundary of the jobsite (California Code of Regulations, Title 24, Part 11, 5.408).
  - 3. Requirements for submittal of Contractor's Construction Waste and Recycling Plan prior to the commencement of the Work.
  - 4. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments submitted to the Architect.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3516, Alteration Project Procedures.
- B. Section 01 5000, Temporary Facilities & Controls.
- C. Section 01 7329, Cutting and Patching.
- D. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.

### **1.3 REFERENCES AND STANDARDS**

- A. California Green Building Standards Code (CALGreen), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 DEFINITIONS**

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Enforcement Agency (EA).
- B. Construction and Demolition Debris: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous as defined in California Code of Regulations, Title 22, Section 66261.3 et seq. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing

**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**  
**SECTION 01 7419**  
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material, ceramic tile, carpeting, plastic pipe, and steel. The debris may be commingled with rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.

- C. C&D Recycling Center: A facility that receives only construction and demolition debris material that has been separated for reuse prior to receipt, in which the residual (disposed) amount of waste in the material is less than 10% of the amount separated for reuse by weight.
- D. Disposal: Final deposition of construction and demolition or inert debris into land, including stockpiling onto land of construction and demolition debris that has not been sorted for further processing or resale, if such stockpiling is for a period of time greater than 30 days; and construction and demolition debris that has been sorted for further processing or resale, if such stockpiling is for a period of time greater than one year, or stockpiling onto land of inert debris that is for a period of time greater than one year.
- E. Enforcement Agency (EA): Enforcement agency is the authority having jurisdiction within the Project location.
- F. Inert Disposal Facility or Inert Waste Landfill: A disposal facility that accepts only inert waste such as soil and rock, fully cured asphalt paving, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, and ceramics, for land disposal.
- G. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- H. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- J. Reuse. The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- K. Separated for Reuse. Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream for the purpose of additional sorting or processing those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace, and includes materials that have been "source separated".
- L. Solid Waste: All putrescible and nonputrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other

**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**  
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discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.

- M. Source-Separated: Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation, for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.
- N. Waste Hauler: A company that possesses a valid permit from the local waste management authority having jurisdiction to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

## **1.6 ACTION SUBMITTALS**

- A. Contractor's Construction Waste and Recycling Plan:
  - 1. Review Contract Documents and estimate the types and quantities of materials under the Work that are anticipated to be feasible for on-site processing, source separation for re-use or recycling. Indicate the procedures that will be implemented in this program to effect jobsite source separation, such as, identifying a convenient location where dumpsters would be located, putting signage to identify materials to be placed in dumpsters, etc.
  - 2. Prior to commencing the Work, submit Contractor's Construction Waste and Recycling Plan. Submit in format provided with this specification section. The Plan must include, but is not limited to the following:
    - a. Contractor's name and project identification information;
    - b. Procedures to be used;
    - c. Materials to be re-used and recycled;
    - d. Estimated quantities of materials;
    - e. Names and locations of re-use and recycling facilities/sites;
    - f. Tonnage calculations that demonstrate that Contractor will re-use and recycle a minimum of 65% by weight of the construction waste materials generated by the Work.
  - 3. Contractor's Construction Waste and Recycling Plan must be approved by the Architect prior to the start of Work.



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4. Contractor's Construction Waste and Recycling Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures

**1.7 INFORMATIONAL SUBMITTALS**

**A. Contractor's Reuse, Recycling, and Disposal Report:**

1. Submit Contractor's Reuse, Recycling, and Disposal Report on the form provided with this specification section with each Application & Certificate for Payment. Failure to submit the form and its supporting documentation will render the Application & Certificate for Payment incomplete and delay progress payments. If applicable, include manifests, weight tickets, receipts, and invoices specifically identifying the Project for re-used and recycled materials:
  - a. Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick).
  - b. Salvaging building materials or salvage items at an offsite salvage or reuse center (i.e. lighting, fixtures).
  - c. Recycling source separated materials on site (i.e. crushing asphalt/concrete for base course, or grinding for mulch).
  - d. Recycling source separated material at an offsite recycling center (i.e. scrap metal or green materials).
  - e. Use of material as Alternative Daily Cover (ADC) at landfills.
  - f. Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
  - g. Disposal at a landfill or transfer station (where no recycling takes place).
  - h. Other (describe).
2. Contractor's Reuse, Recycling, and Disposal Report must quantify all materials generated in the Work, disposed in Class III landfills, or diverted from disposal through recycling. Indicate zero (0) if there is no quantity to report for a type of material. As indicated on the form:
  - a. Report disposal or recycling either in tons or in cubic yards. If scales are available at disposal or recycling facility, report in tons; otherwise, report in cubic yards. Report in units for salvage items when no tonnage or cubic yard measurement is feasible.
  - b. Indicate locations to which materials are delivered for reuse, salvage, recycling, accepted as daily cover, inert backfill, or disposal in landfills or transfer stations.
  - c. Provide legible copies of weight tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.
    - 1) Indicate project title, project number, progress payment number, name of the company completing the Contractor's Report and compiling backup documentation, the printed name, signature, and daytime phone number of the person completing the form, the beginning and ending dates of the period covered on the Contractor's Report, and the date that the Contractor's Report is completed.

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3. Demonstrate compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green" 5.408.2, to the satisfaction of the enforcing agency.
  - a. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  - b. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

**PART 2 - PRODUCTS-NOT USED**

**PART 3 - EXECUTION**

**3.1 WASTE MANAGEMENT PLAN**

- A. Implement procedures for disposal of materials, as specified in Contractor's Construction Waste and Recycling Plan, which are not diverted for re-use, salvage or recycling.
  1. Identify materials to be diverted from disposal by efficient usage, recycling, reuse on the project, or salvage for future use or sale.
  2. Determine if materials will be sorted on-site or mixed.
  3. Identify diversion facilities where material collected will be taken.
  4. Specify that quantities of diverted material will be calculated by weight or volume, but not both.

**3.2 SALVAGE, RE-USE, RECYCLING AND PROCEDURES**

- A. Re-use, Salvage, and Recycling Facilities: As specified in Contractor's Construction Waste and Recycling Plan.
- B. Develop and implement procedures to re-use, salvage, and recycle new construction and excavation materials, based on the Contract Documents, the Contractor's Construction Waste and Recycling Plan, estimated quantities of available materials, and availability of recycling facilities. Procedures may include on-site recycling, source separated recycling, and/or mixed debris recycling efforts.
  1. Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.
  2. Source separate new construction, excavation and demolition materials including, but not limited to the following types.
    - a. Asphalt.
    - b. Concrete, concrete block, slump stone (decorative concrete block), and rocks.
    - c. Drywall.
    - d. Green materials (i.e. tree trimmings and land clearing debris).

**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**  
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- e. Metal (ferrous and non-ferrous).
  - f. Miscellaneous Construction Debris.
  - g. Paper or cardboard.
  - h. Red Clay Brick.
  - i. Reuse or Salvage Materials
  - j. Soils.
  - k. Wire and Cable.
  - l. Wood.
  - m. Other (describe)
3. Miscellaneous Construction Debris: Develop and implement a program to transport loads of mixed (commingled) new construction materials that cannot be feasibly source separated to a mixed materials recycling facility

**3.3 DISPOSAL OPERATIONS AND WASTE HAULING**

- A. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.
- B. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority having jurisdiction.
- C. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, prior to delivering materials.
- D. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
- E. Do not burn, bury or otherwise dispose of solid waste on the project job-site.

**3.4 RE-USE AND DONATION OPTIONS**

- A. Implement a re-use program to the greatest extent feasible. Options may include:
  - 1. California Materials Exchange (CAL-MAX) Program is sponsored by the California Integrated Waste Management Board. CAL-MAX is a free service provided by the California Integrated Waste Management Board, designed to help businesses find markets for materials that traditionally would be discarded. The premise of the CAL-MAX Program is that material discarded by one business may be a resource for another business. To obtain a current Materials Listings Catalog, call CAL-MAX/California Integrated Waste Management Board at (916) 255-2369 or send a FAX to (916) 255-2200. The CALMAX Catalog is available through the Internet Site at <http://www.ciwmb/ca.gov/calmax>.

**3.5 REVENUE**

- A. Revenues or other savings obtained from recycled, re-used, or salvaged materials shall accrue to Contractor unless otherwise noted in the Contract Documents

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**END OF SECTION**

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management and disposal.docx  
Last Updated: December 16, 2021*

**1.1 SUMMARY**

- A. Section Includes: Administrative and procedural requirements for Contract closeout.
- B. These requirements supplement those included in the General Conditions and are subject to modification upon mutual agreement between the Architect, Owner, and Contractor.

**1.2 FINAL CLEANING**

- A. Immediately prior to completion and occupancy, remove marks, stains, fingerprints, dust, dirt and paint drippings resulting from work of this project, including roofs, walls, floors, sidewalks, paving and other finished surfaces.
- B. Contractor shall engage the services of an independent, professional cleaning service to perform final cleaning after Contractor's final clean-up is completed.
- C. Materials:
  - 1. Use only those cleaning materials that will neither create hazards to health or property, damage surfaces, and are in compliance with Proposition 65.
  - 2. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
  - 3. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
  - 4. Use only environmentally acceptable "green" cleaning products.
- D. Remove temporary labels, tags and paper covering.

**1.3 REQUIREMENTS PREPARATORY TO FINAL ACCEPTANCE**

- A. Temporary facilities shall be removed from site.
- B. Plumbing, mechanical and electrical equipment shall operate quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent objectionable noise or vibration. Systems shall operate without humming, surging, or rapid cycling.
- C. Operating instructions for equipment shall be properly mounted and posted.
- D. Training: Provide training and orientation of Owner's operating staff in proper care and operation of equipment, systems and controls including:
  - 1. Fire protection systems.
  - 2. Plumbing equipment.
  - 3. HVAC equipment.
  - 4. Control systems.

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5. Fire alarm systems.
  6. Other systems as required in the specifications or needed to properly instruct Owner's representatives.
  7. Three copies of certificate, signed by the Owner's representative, attesting to their having been instructed.
- E. The following shall be submitted in accordance with Section 01 3300, Submittal Procedures.
1. Completed Record Drawings signed by Contractor and Inspector.
  2. Maintenance and Operating instructions and manuals.
  3. Certifications completed and signed.
  4. Guarantees and warranties as specified and required by the General Conditions.
- F. Contractor's Final Verified Report (Form DSA 6-C) and other Reports and Affidavits required by Division of State Architect shall be submitted; originals and one copy.
- G. Extra Stock shall be delivered and acknowledged by the Owner in quantities specified.

**1.4 PUNCH LIST**

- A. Prior to Architect's punch list, Contractor shall prepare and address initial deficiencies list for all work. Upon completion, this list shall be sent to the Architect.
- B. Contractor shall notify Architect when Contractor, with concurrence of Inspector, feels project is complete enough for preparation of Architect's punch list.
- C. Architect will then notify appropriate consultants including civil, mechanical and electrical engineers, landscape architect, food service designer and others as needed, to make their inspections and prepare "punch lists". Consultant "punch lists" will be completed before Architect will make its "punch list".
- D. Architect will prepare a "punch list".
- E. Punch lists will be published within 14 days of Architect's walk through.
- F. Work on the punch list, except minor items as determined by the Architect, shall be completed prior to completion and occupancy.

**1.5 FINAL ACCEPTANCE**

- A. After requirements preparatory to Final Acceptance have been completed as hereinbefore specified, Contractor shall notify Architect to perform acceptance tour. Notice shall be given at least three days in advance of the time the acceptance tour is to be performed.
- B. Contractor or its principal superintendents authorized to act in behalf of Contractor, shall accompany Architect and Inspector on acceptance tour, as well as any principal subcontractors that Architect may request to be present.

**CLOSEOUT PROCEDURES**  
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- C. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will recommend Final Acceptance to the Owner and initiate the filing of the Notice of Completion.
- D. If work has been substantially completed in accordance with Contract Documents, and only minor corrective measures are required, Architect will recommend that Owner conditionally accept Project and file Notice of Completion based upon Contractor's assurance that corrective measures will be completed within shortest practicable time period (but absolutely not later than 30 days).
- E. If work has not been substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend one or the other of the following:
  - 1. That Owner accept Project and file Notice of Completion only upon receiving from Contractor a Cashier's Check in amount sufficient to account for corrective measures still required, in the event that Owner had to have others complete the work.
  - 2. That Owner not accept project and not file Notice of Completion. Instead, based on information gathered from acceptance tour, Contractor will be required to complete all corrective measures and then call for another project acceptance tour following procedure outlined above.
- F. Should any corrective measures remain incomplete at time final payment is due, Contractor shall provide Owner with Money Order(s) or Cashier's Check in exchange for retention. Money Order(s) or Cashier's Check shall be in an amount one and one-half times the agreed estimated cost as determined by the Architect.
- G. Upon Final Acceptance of Project by Owner, Contractor shall submit his request for final payment, less retention. Retention payment will not be made by Owner until 35 days after board acceptance and filing of Notice of Completion with County Recorder, as specified in General Conditions.
- H. Retention payment will not be made until Contractor has filed the required Form DSA 6-C with DSA with two original copies to the Architect.

**1.6 CLOSEOUT CHECKLIST**

- A. The following items are to be fully completed and/or submitted as a condition for final acceptance of the project (as applicable)
  - 1. Specifications and Plans Review for Closeout
  - 2. Fire Alarm System Certification
  - 3. Megger Grounding Test Certificate
  - 4. Certificate of Compliance for Building Materials
  - 5. Contractor's Reuse, Recycling and Disposal Report
  - 6. Environmental Product Certification as required under Section 01 3543
  - 7. Indoor Air Quality Report (Section 01 3543)

**CLOSEOUT PROCEDURES**  
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8. Certifications as required under Section 01 3300.
9. Air Balance Report
10. Operation & Maintenance Manuals
11. Guarantees/Warranties
12. Training
13. Record Drawings
14. Labels and name plates on all electrical panels
15. Keys (from Contractor - properly labeled):
  - a. electrical panel keys
  - b. communication panel keys
  - c. all cabinet keys
  - d. extra door keys as required by specifications
16. Punch List Items Completed
17. Extra Stock of Specified Items, delivered to Owner (including documents)
18. Back charges Resolved
19. Removal of Stop Notices
20. Contractor's Final Verified Reports (DSA 6-C)

**END OF SECTION**

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procedures.docx  
Last Updated: July 13, 2018*



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for explicit warranties, guarantees, bonds, and service and maintenance contracts specified in the individual Sections and supplementing the requirements included in the General Conditions.
  - 2. Guarantee and warranty period inspections.
  - 3. Forms for Guarantees/Warranties.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3300, Submittal Procedures; additional requirements and submittal procedures for guarantees/warranties.

### **1.3 DEFINITIONS**

- A. General: The following definitions apply to the language used in these Specifications.
- B. Warranty: A representation or affirmative covenant that the work will be performed in accordance with certain standards stated in the Contract, such as in "a good and workmanlike manner," and otherwise be free of defects and in conformity with the Contract Documents for the duration noted or, if a duration is not indicated, the statute of limitations period for contract breaches will constitute the time frame for enforcement.
- C. Guarantee: A provision of the warranty which becomes operative after completion of the work under the Contract and requires replacement of defective or non-conforming materials or equipment, or remedy improper workmanship, at the guarantors own cost and expense, for the duration noted under the General Conditions of the Contract or in the Specifications.
- D. Standard Product Guarantees/Warranties: Preprinted written documents published by individual manufacturers for particular products and specifically endorsed by the manufacturer to the Owner.
- E. Contractor Standard Guarantee: The Contractor's guarantee for the term included in the General Conditions.
- F. Subcontractor Standard Guarantee: A Subcontractor's guarantee period that coincides with the term of the Contractor's guarantee included in the General Conditions.
- G. Special Guarantees/Warranties: Written guarantees/warranties required by or incorporated in the Contract Documents to be provided by the Contractor or its Subcontractors to either extend time limits of the Standard Guarantees/Warranties included in the General Conditions or to provide greater rights for the Owner.

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**1.4 GENERAL REQUIREMENTS**

- A. Guarantees/warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect those issued to the Owner.
- B. Contractor shall not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others nor shall it be responsible for damaged parts whose replacement is necessitated by failure of Owner's maintenance forces to properly clean and service them, provided that Contractor has furnished complete operating and maintenance instructions to Owner.
- C. By terms of each guarantee/warranty, unless otherwise specified or stipulated, also agree to remove and replace other work, as required, that has been connected to or superimposed on substrate material to be replaced.
- D. In addition to other requirements specified:
  - 1. Compile specified service and maintenance contracts.
  - 2. Coexecute submittals when specified.
  - 3. Review submittals to verify compliance with Contract Documents.
  - 4. Submit to Architect for review and transmittal to Owner.
- E. In case of items remaining incomplete after date of filing of the Notice of Completion, the guarantee/warranty period shall run from the date of acceptance of such items.
- F. Special guarantees/warranties applicable to definite parts of the Work and as specifically stipulated in the respective Sections of the Specifications or other Contract Documents shall be subject to the terms of this Section.
- G. If repairs or changes are required in connection with the work within a guarantee/warranty period, the Contractor shall, promptly upon receipt of notice from the Owner and without expense to the Owner, comply with the following:
  - 1. Correct defects and place in satisfactory condition the work covered by the respective guarantee/warranty.
  - 2. Repair, to the satisfaction of the Owner, damage to the Buildings and/or site that is the result of the cause for said repairs and changes.
  - 3. Repairs and corrective work shall be made to the satisfaction of the Owner including the equipment and contents of the Buildings and/or site disturbed during performance of the guarantee/warranty work.
- H. The Owner may, at its sole discretion, proceed with the correction work at Contractor's expense if Contractor does not proceed with the corrective work within a reasonable time fixed by a written notice from the Owner.
  - 1. As part of the corrective work, the Owner reserves the right to remove and store or dispose of defective equipment or material at Contractor's expense.
  - 2. If Contractor does not pay the costs of such removal and storage within ten days thereafter, the Owner may, upon ten additional days' written notice, sell such

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defective items and shall account for the net proceeds after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's additional services.

3. If the proceeds from the sale are insufficient to cover all amounts chargeable to Contractor, Contractor shall pay the difference to the Owner.
- I. If repairs or changes are required in connection with guarantee/warranty work and notice is given within the guarantee/warranty period, the warranty shall continue until the corrective work has been completed, regardless of the termination of the specified guarantee/warranty period.
- J. In case of work performed by subcontractors and where a special guarantee/warranty is required, guarantees/warranties addressed to and in favor of the Owner shall be secured from said subcontractors.
- K. No provision in the Contract Documents or in any special or general guarantee/warranty shall be held to limit, as to time or scope of liability, the Contractor's liability for defects or the liability of its sureties to less than the legal limit of liability under laws having jurisdiction.
- L. The delivery of any guarantees/warranties shall not relieve the Contractor from any obligation assumed under any other provision of the Contract Documents.
- M. The obligation of the Contractor under this Section shall survive the termination of the Contract.

**1.5 SUBMITTAL REQUIREMENTS**

- A. Assemble guarantees/warranties, bonds, and service and maintenance contracts executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Format:
  1. Size: 8-1/2-inch-by 11-inch sheets, punched for three-ring binder. Fold larger sheets to fit into binders.
  2. Binders: Commercial quality, three-ring, "View" type, with durable and cleanable plastic covers.
  3. Cover: Identify each packet with typed or printed title, "GUARANTEES/WARRANTIES," and list the title of Project and name of Contractor.
- C. Contents:
  1. Neatly typed, in orderly sequence.
  2. Provide complete information for each item including:
    - a. Product or work item.
    - b. Firm name with name of principal, address, and telephone number.
    - c. Beginning date and duration of warranty, bond, or service and maintenance contract.

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3. Provide the following information for Owner's personnel:
    - a. Proper procedure in case of failure.
    - b. Circumstances that might affect the validity of guarantee/warranty or bond.
  4. Contractor's name, name of responsible principal, address, and telephone number.
- D. Refer to Section 01 3300, Submittal Procedures, for additional requirements.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 TIME OF SUBMITTALS**

- A. Typical: Within 30 days after filing date of Notice of Completion.
- B. Equipment or component parts of equipment put into service during progress of construction; submit documents within 10 days after inspection and acceptance.
- C. Items of work, where acceptance is delayed materially beyond date of filing date of Notice of Completion; provide updated submittal within 14 days after acceptance, listing date of acceptance as start of guarantee/warranty period.

**3.2 GUARANTEE PERIOD INSPECTIONS**

- A. Contractor and subcontractors performing the construction work are required to guarantee workmanship and materials for the period noted in the Contract. Within a month of the end of such guarantee period, Contractor's agent shall prepare an inspection report indicating the condition of the Owner's facility and related common facility, itemizing the work to be completed, performed and/or corrected. Such guarantee period shall be continued in effect and extended until such time as Owner submits to Contractor written confirmation of the satisfactory completion of the itemized work, which confirmation shall be submitted within a reasonable period of time.

**3.3 GUARANTEE/WARRANTY FORMS**

- A. Contractor Standard Guarantee: Submit the following written Standard Guarantee/Warranty form for the overall Work against defects in materials and workmanship for the period of guarantee/warranty required under the Contract after the filing of the Notice of Completion (included with this section).
- B. Subcontractor Standard Guarantee: Submit the following written Standard Guarantee/Warranty form for Subcontracted Work against defects in materials and workmanship for the period of guarantee/warranty required under the Contract after the filing of the Notice of Completion (included with this section).
- C. Subcontractor Special or Extended Guarantee/Warranty: Contractor shall have its Subcontractor submit the following Special Extended Written Guarantee/Warranty, typed

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on Subcontractor's letterhead, when required by a Specification Section for a period in excess of 2 years (included with this section).

**END OF SECTION**

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*Last Updated: February 13, 2019*

*(Letterhead of Contractor)*

STANDARD GUARANTEE / WARRANTY

for

\_\_\_\_\_  
Project Name

\_\_\_\_\_  
Contract No.

We hereby warrant that the Work we have provided under the above reference Contract has been completed in accordance with the Drawings, Specifications, and other Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within the period of 24 months from the date of filing of the Notice of Completion of the above named Project by the Board of Trustees of the School District, and we also agree to repair any and all damages resulting from such defects, without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with above-mentioned guarantee conditions within ten (10) day after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Contractor) \_\_\_\_\_

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Printed Name of Authorized Representative)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

COUNTERSIGNED (Owner) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Authorized Representative)

\_\_\_\_\_  
Signature

Date of Filing or Notice of Completion: \_\_\_\_\_

(Letterhead of Company)

SUBCONTRACTOR STANDARD GUARANTEE / WARRANTY

We hereby warrant that

\_\_\_\_\_

which we have provided in \_\_\_\_\_

for \_\_\_\_\_

Name of Project

District

has been completed in accordance with Specification Section \_\_\_\_\_ and requirements of the Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within a period of 24 months from date of filing the Notice of Completion of the above-named Project by the Board of Trustees of the School District without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with above-mentioned guarantee conditions within ten (10) day after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Subcontractor)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Company Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

COUNTERSIGNED (General Contractor)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Company Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

(Letterhead of Company)

SPECIAL EXTENDED WRITTEN GUARANTEE / WARRANTY

We hereby warrant that

\_\_\_\_\_

which we have provided in \_\_\_\_\_

\_\_\_\_\_

Name of Project

for \_\_\_\_\_

\_\_\_\_\_

District

has been completed in accordance with Specification Section \_\_\_\_\_ and requirements of the Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within a period of \_\_\_\_\_ year(s) from date of filing the Notice of Completion of the above-named Project by the Board of Trustees of the School District without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted. We also agree to repair any and all damages resulting from such defects.

In the event of our failure to comply with above-mentioned conditions within a reasonable time but in no case longer than ten (10) calendar days after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Subcontractor)

\_\_\_\_\_

(Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

COUNTERSIGNED (General Contractor)

\_\_\_\_\_

(Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes general requirements and procedures for compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".

- 1. Chapter 5- Non-Residential Mandatory Measures.

### **1.2 RELATED REQUIREMENTS**

- A. Pertinent sections specifying erosion control.
- B. Section 01 3543, Environmental Procedures.
- C. Section 01 6116, Volatile Organic Compound (VOC) Restrictions.
- D. Section 01 7419, Construction Waste Management and Disposal.
- E. Section 01 7700, Closeout Procedures.
- F. Pertinent sections specifying landscape irrigation.

### **1.3 DEFINITIONS**

- A. CAL-Green Definitions: Certain terms are defined by CAL-Green in Chapter 5 of the code. Words and terms used in this section shall have the meanings shown therein.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Respond to questions and requests from Architect and the jurisdiction having authority regarding CAL-Green credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures. Document responses as informational submittals.

### **1.5 SUBMITTALS**

- A. CAL-GREEN Submittals: Submit CAL-GREEN submittals required by code and in other Specification Sections.
  - 1. CAL-GREEN submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CAL-GREEN requirements.
  - 2. Acceptable verification submittals are specified in the related sections.

**SUSTAINABLE DESIGN REQUIREMENTS**  
**SECTION 01 8113.10**  
**3431005**

**PART 2 - PRODUCTS**

**2.1 REQUIREMENTS - GENERAL**

- A. Provide products and procedures necessary to confirm CAL-GREEN compliance required in this Section. Although other Sections may specify some CAL-GREEN requirements, the Contractor shall determine additional materials, techniques, means, methods and procedures necessary to comply with CAL-GREEN requirements.

**2.2 CONSTRUCTION WASTE REDUCTION**

- A. Section 5.408 Construction Waste Management, Diversion and Recycling: Comply with requirements of this code section, local ordinances and Section 01 7419.

**2.3 BUILDING MAINTENANCE AND OPERATION**

- A. Section 5.410.2.5. Documentation and Training: Provide Operations Training as required by these code sections and as specified in Section 01 7700 and Systems Manual as specified in Section 01 7700.

**2.4 POLLUTANT CONTROL**

- A. Section 5.504.3 Indoor Air Quality: Comply with requirements of this code section, local ordinances and Section 01 3543.
  - 1. During storage, rough installation and until final start-up of HVAC equipment, securely cover all ducts and air distribution component openings with plastic, tape, sheet metal or other methods acceptable to enforcing agency to reduce dust or debris collected in the system.
- B. Section 5.504.4 Finish Material Pollutant Control: All Finish materials shall comply with requirements of this code section, local ordinances and Section 01 6116.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Comply with Section 01 7419, Construction Waste Management and Disposal.
- B. Comply with execution requirements of related sections and applicable local codes and ordinances.

**END OF SECTION**

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*Last Updated: April 8, 2019*

**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Rough carpentry.
- B. Related Sections:
  - 1. Section 01 35 42, CALGreen Requirements.

**1.02 REFERENCE STANDARDS**

- A. Conform to current adopted reference standards by date of issue of the current code cycle and the date of the Contract Documents.
- B. ASTM International:
  - 1. ASTM D 3498 - Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
  - 2. ASTM D 4601 - Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
  - 3. ASTM E 84 - Surface Burning Characteristics of Building Materials.
- C. CBC - California Building Code, 2022
- D. California Green Building Standards Code, CALGreen - 2022.
- E. DOC PS 1 - Department of Commerce Product Standard, U. S. Product Standard for Construction and Industrial Plywood.
- F. DOC PS 20 - Department of Commerce Product Standard, American Softwood Lumber Standards.
- G. DOC PS 2 - Department of Commerce Product Standard, U. S. Product Standard for Construction, Performance Standard for Wood-Based Structural-Use Panels.
- H. ANSI A135.4 - Basic Hardboard.
- I. WWPA - Western Lumber Grading Rules 88, Latest Edition, by Western Wood Products Association.
- J. HPVA HP-1 - American National Standard Institute, Hardwood Plywood and Veneer Association.
- K. APA - The Engineered Wood Association. The Construction Guide.

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- L. AWWA C1, C2, C3, C9, C27 - American Wood Preservers Association - Manual of Recommended Practice.
- M. AWWA C20 - American Wood Preservers Association Standards, Structural Lumber - Fire-Retardant Treatment by Pressure Process.
- N. WCLIB - West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.
- O. Title 8 - California Code of Regulations, Construction Safety Orders.
- P. ICC - ES - International Code Council Evaluation Service, Inc. Legacy Reports.
- Q. RIS - Redwood Inspection Service, Standard Specifications for Grades of California Redwood Lumber.
- R. Local AQMD - Local Air Quality Management District Regulations.

## 1.03 SUBMITTALS

- A. Product Data: For the following:
  - 1. Product Data and current ICC Legacy Reports.
- B. Material Certificates.
- C. CALGreen Submittals:
  - 1. Product Data Sheets and Declaration Statements showing compliance with CALGreen Code per 1.04.A.

## 1.04 QUALITY ASSURANCE

- A. California Green Building Standards Code, CALGreen - 2022.
  - 1. Adhesives, sealants, primers, and caulks shall comply with air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits, per CALGreen Tables 5.504.4.1 and 5.504.4.2.
  - 2. Paints and Coatings shall comply with VOC limits in Table 1 of the ARB, per CALGreen Table 5.504.4.3.
  - 3. Composite wood products (plywood, particle board, medium density fiberboard) shall comply with Formaldehyde limits per CALGreen Table 5.504.4.5.
- B. Rough Carpentry Lumber: Visible grade stamp on all products required.
- C. Grade Stamp: Association under whose rules it was graded, or official grade mark of other recognized grading agencies using grading rules, equivalent to WWPA or WCLIB.
- D. Association performing grading and grade marking of lumber shall be approved by Architect and Division of the State Architect.

- E. Nailing guns and nail operators shall be approved in accordance with Title 8 Construction Safety Orders.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver rough carpentry items until site conditions are adequate to receive the Work. Protect items from weather while in transit.
- B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raise above ground and out of contact with damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around stacks and under temporary covers. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.
- C. Install bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles materials, erection equipment or other loads are carried by frame during its erection.

## 1.06 FIELD CONDITIONS

- A. Cooperate with other trades in coordinating their Work with the Work of this Section. Provide wood grounds, blocking and nailer where indicated or as required for Work of other trades.

## PART 2 - PRODUCTS

### 2.01 ROUGH CARPENTRY MATERIALS

- A. Lumber: Graded in accordance with WWPA or WCLIB; maximum moisture content of 19 percent at time of installation. Provide Douglas Fir Larch for structural and framing lumber, surfaced four sides to standards of the grading association unless otherwise indicated on Drawings, use the following grades:
  - 1. Joists, rafters, beams, lintels, horizontal framing, posts, studs and vertical framing: No. 1 unless otherwise indicated or noted on drawings.
  - 2. Non-bearing studs and plates, non-structural furring, concealed blocking, stripping and miscellaneous nailers and backing: No. 2 unless noted otherwise in the structural drawings.
  - 3. Structural Drawings take precedence for lumber grades.
  - 4. All lumber in contact with concrete shall be pressure treated.
- B. Plywood: CBC Section 2303.3 and 2304.6, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification; Exposure 1 plywood grade. Thickness as indicated, span rating sized for spacing.

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1. For painted finish for interior and exterior: APA Sanded Plywood Panels, Panel Grade A-C, Group 1, Exterior plywood grade, sanded face, touch sanded back side.
  2. Exposure 1 plywood grade: "CDX", Structural I, C-D.
- C. Roof Plywood Decking: requiring FM 1-90 Wind and Fire Classification, minimum 1/2" thick. CBC Section 2304.8, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification: Exposure 1, B-C Veneer Grade, sanded 1 side. Thickness as indicated, span rating sized for spacing.
- D. Board Roof Decking: 2 x 6 Douglass Fir, kiln dry, #1 Grade Lumber, Tongue and Groove, surfaced one side.
- E. Preservative (Pressure) Treated Lumber: Section 2303.1.9 Conform to AWPAs Manual of Recommended Practice, kiln dry after treatment. Use preservative complying with AWPAs C2 lumber and C9 plywood, latest edition. Products NOT containing arsenic or chromium. Conform to AQMD, Local Regulations.
1. Douglas Fir Larch, used as required by Section 2303.1.9.1, CBC, shall conform to the following:
    - a. Lumber shall be WWPAs or WCLIB grade stamped.
    - b. Lumber shall be No. 1 grade or better unless indicated otherwise on Drawings.
- F. Plywood Backing Panels - Backboards:
1. Telephone and Electrical Equipment backboards, fixed equipment, cabinets, grab bars, door stops and plates: DOC PS 1, Exposure 1, APA A-C, sanded, Veneer Grade, fire-retardant treated, in thickness indicated or, if not indicated, not less than 5/8-inch nominal thickness. Installed "A" side out for paint finish.

## 2.02 ACCESSORIES

- A. Nails, Spikes and Staples: Section 2304.10 CBC, Galvanized for exterior applications, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application. Comply with Table 2304.10.1. Use common nails only.
- B. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.10 CBC, sized to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations. Full diameter body bolts only per ASME B18.2.1(.2) or B18.2.6 for structural applications.
- C. Soffit vents: Soffit Vents: Extruded aluminum material, 4-inch soffit vent unless otherwise noted on drawings. By Belmont, CA, Flannery, Inc., San Fernando, CA, Fry Reglet Company, Alhambra, CA, or equal.
- D. Expansion type or powder actuated type for anchorage to solid masonry or concrete.
1. Kwik Bolt TZ2 (KB-TZ2) Concrete Anchor, 3/8- to 3/4-inch diameter, ICC-ES ESR-4266, by Hilti Inc., Tulsa, OK. Or Strong-Bolt 2 concrete anchor, 1/2, 5/8, 3/4 and 1 inch diameter, ICC-ES ESR-3037, by Simpson Strong-Tie, Pleasanton, CA. Or equal with ICC Report Number.

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2. Kwik Bolt TZ2 (KB-TZ2) 1/4- to 3/4-inch diameter, ICC-ES ESR-4561, by Hilti. Or equal with ICC Report Number.
- E. Stock Framing Connectors: Section 2304.10 CBC types indicated on Drawings, galvanized, with nails fully driven in all holes in each face of connector. Conform to the following.
  1. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, United Steel Products, Montgomery, MN. or equal.
- F. Non-Stock Framing Connectors: Conform to details.
- G. Nonshrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time. Acceptable Manufacturers: Dayton Superior, Miamisburg, OH; Sonneborn, Shakopee, MN; Novex Systems International, Clifton NJ, or equal.
- H. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- I. Adhesives: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
  1. Adhesives shall comply with Local AQMD and California VOC Regulations.

## PART 3 - EXECUTION

### 3.01 LAYOUT MARKINGS

- A. Layout markings shall not be made with xylene-based inks, paint, or dyes, or with other solvent-based products that may bleed through finishes.

### 3.02 FRAMING, FURRING AND STRIPPING

- A. Erect wood framing, furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch in 10 feet, non-cumulative.
- B. Construct members of continuous pieces of longest possible lengths.
- C. Construct and erect required headers and lintels.
- D. Double wall framing members at openings over 100 square inches. Space short members above and below openings in same manner as for walls.
- E. Provide double joist headers at joist ends and around openings unless otherwise indicated on Drawings. Bridge joists and rafters to conform CBC Section 2306.1.1 and as noted on plans. For pre-manufactured joists, provide bridging in accordance with manufacturer's recommendations.

- F. Construct walls with studs of size and spacing indicated, 16 inches on center unless otherwise indicated on drawings. Install single sill member at bottom and double plate at top. Stagger upper and lower members of double plate with joints not less than 4 feet o.c. or as indicated on Drawings. Where sill or any wood member contacts concrete or masonry, install preservative-treated lumber.
- G. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at ceiling and floor lines and at spacing not to exceed 8 feet on center vertically. Fit snugly and attach with not less than two 16d nails.
- H. Install 3 studs at corners.
- I. Conform to CBC Section 2308.5.8, where pipes penetrate sills or plates.
- J. Cutting and Notching: Conform to CBC Section 2308.5.9.
- K. Bored Holes: Conform to CBC Section 2308.5.10.
- L. Conform to CBC Section 718 for fire blocks and draft stops. Fire blocks and stops at 10-foot intervals and at ceiling level.
- M. Fire-Retardant Wood: Ripping and milling are not permissible. Cross cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating. All cuts on plywood are considered end cuts and is permissible to be cut.

## 3.03 2 X ROOF DECKING

- A. Place floor decking] with end joints staggered. Secure boards over firm bearing. Maintain tight spacing between joints of boards. Place diagonal to framing members of rafters or joists.
- B. Maintain surface flatness of maximum 1/8 inch in 10 ft.
- C. Fit edges tight and secure with nails.

## 3.04 PLYWOOD SHEATHING

- A. Thickness as indicated on the Drawings, minimum thickness 1/2 inch.
- B. Boundary Nailing: Not less than 3/8 inch from edge, spaced not more than 6 inches on center, unless noted otherwise on Drawings.
- C. Blocking: Panel edges shall bear on framing members or solid blocking.
- D. Minimum Size Vertical Panel: 16 inches wide.
- E. Minimum Size Horizontal Panel: 24 inches wide.



- F. Oriented Strand Board not permitted for shear panels unless indicated on structural drawings.

## 3.05 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.

## 3.06 HORIZONTAL FRAMING

- A. Bearing: 1-1/2-inch minimum on wood or metal, 3 inches on masonry. Lay framing members with crown up. Members with knots at bottom not permitted.
- B. Lateral Support: Use solid blocking, cross bridging or other approved means.
- C. Lap joists a minimum of 3 inches when framed from opposite sides of a beam. Do not run joists continuous beyond one span unless indicated otherwise on Drawings.
- D. Openings: Double joists required for trimmer and headers for openings 4 ft. or larger unless indicated otherwise on Drawings.
- E. Provide ties, purlins and blocking in conformance with CBC Sections 2308.8.5.
- F. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

## END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Electric motors.
  - 2. Gauges.
  - 3. Access Doors.
  - 4. Flexible joints.
  - 5. Insulation.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 22 Section.

### **1.3 ADDITIONAL REQUIREMENTS**

- A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.
- C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

### **1.4 REFERENCES AND STANDARDS**

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. CSA – Canadian Standards Association International.
  - 2. ANSI - American National Standards Institute.
  - 3. ASTM - American Society for Testing and Materials.
  - 4. CCR - California Code of Regulations.
    - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
  - 5. NCPWB - National Certified Pipe Welding Bureau.
  - 6. CEC - California Electrical Code.
  - 7. NEMA - National Electrical Manufacturers' Association.

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8. NFPA - National Fire Protection Association.
9. OSHA - Occupational Safety and Health Act.
10. UL - Underwriters' Laboratories, Inc.

**B. Requirements of Regulatory Agencies:**

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
  - a. California Building Code, 2022.
  - b. California Electrical Code, 2022.
  - c. California Energy Code, 2022.
  - d. California Fire Code, 2022.
  - e. California Green Building Standards Code, 2022.
  - f. California Mechanical Code, 2022.
  - g. California Plumbing Code, 2022.
  - h. California Code of Regulations, Title 24.
  - i. California Health and Safety Code.
  - j. CAL-OSHA.
  - k. California State Fire Marshal, Title 19 CCR.
  - l. National Fire Protection Association.
  - m. Occupational Safety and Health Administration.
  - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

**1.5 DRAWINGS**

- A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
  1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
  2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations

- shown. Obtain the Architects approval prior to relocation of equipment and materials.
3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

## **1.6 FEES AND PERMITS**

- A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.
- C. Coordination:
1. General:
    - a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

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- 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
3. Mechanical Coordination:
  - a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
  - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
  - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
  - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

**1.7 SUBMITTALS - GENERAL**

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
  6. Organize submittals in same sequence as in Specification Sections.
  7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation

and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.

- a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
  - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
  - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

## **1.8 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
  1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
  2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

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- D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 6875. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 6875.
- E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
  - 1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
  - 2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
  - 3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
    - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient  $I_p = 1.5$  shall be used for gas piping bracing calculations.
    - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2019 California Building Code
  - 4. Additional Requirements: In addition to the above, conform to all state and local requirements.

**1.9 INFORMATIONAL SUBMITTALS**

- A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 8000. Comply with requirements for layouts specified in Section 23 8000.

**1.10 CLOSEOUT SUBMITTALS**

**A. Operation and Maintenance Data:**

1. Refer to Division 01 for complete instructions.
2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
    - 6) Copies of guarantees/warranties for each item of equipment and systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Control diagrams and literature.
    - 11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
    - 12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
    - 13) Commissioning and Preliminary Operation Tests required as part of the Work.
  - b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

**B. Record Drawings:**

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.



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- b. One complete set of reproducible drawings showing the Work exactly as installed.
- c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
- d. Provide Contractor's signature, verifying accuracy of record drawings.
- e. Obtain the signature of the Project Inspector for all record drawings.

**1.11 SUBSTITUTIONS**

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  - 1. Reason for substitution request.
  - 2. Complete submittal information as described herein; see "Submittals."
  - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  - 5. Explanation of impact on connected utilities.
  - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.
- G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

**1.12 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.
- C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 6875.
- D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.
- E. All materials and products shall be new and shall match existing.

**1.13 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

**1.14 FIELD CONDITIONS**

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

**1.15 WARRANTY**

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

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**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

**2.2 MATERIALS AND PRODUCTS**

- A. No material installed as part of this Work shall contain asbestos.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

**2.3 GAUGES**

- A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

**2.4 ACCESS DOORS**

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  - 1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

- E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  - 1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## **2.5 EQUIPMENT IDENTIFICATION**

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## **2.6 PIPE IDENTIFICATION**

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

## **2.7 INSULATION WORK**

- A. General:
  - 1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
  - 2. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
  - 3. The term "piping" used herein includes pipe, valves, strainers and fittings.
  - 4. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - 5. Provide pre-formed PVC valve and fitting covers.
  - 6. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
  - 7. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

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8. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
9. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

**B. Insulation of Piping:**

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
  - a. Pipe 3/4 inches and smaller: 1 inch thick.
  - b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
  - c. Pipe 2 inches and larger: 2 inches thick.
2. Insulate domestic hot water piping under slab on grade and cold water piping exposed to the weather with 3/4 inch thick Therma-Cel, Armaflex, or equal; seal water tight per manufacturer's directions.
3. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
4. Insulate domestic cold water piping outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
5. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
7. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
  - a. Fitting covers:
    - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 2) Tee covers.

- 3) Flange and union covers.
- 4) End caps.
- 5) Beveled collars.
- 6) Valve covers.
- 7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- b. Jacket thickness:
  - 1) Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
  - 2) Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

### **PART 3 - EXECUTION**

#### **3.1 EXISTING MATERIALS**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.
- D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

#### **3.2 FRAMING, CUTTING AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

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- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

**3.3 PLUMBING DEMOLITION**

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
  - 3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

**3.4 ELECTRICAL REQUIREMENTS**

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### **3.5 PIPING SYSTEM REQUIREMENTS**

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

### **3.6 PRIMING AND PAINTING**

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and Painting:
  - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
    - a. Black Steel Piping:
      - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
      - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
  - 3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

### **3.7 EXCAVATING**

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for



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pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

**3.8 BACKFILLING**

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

**3.9 PIPING SYSTEMS INSTALLATION**

- A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

**B. General:**

1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
3. Install piping to permit application of insulation and to allow valve servicing.
4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

**C. Floor, Wall, and Ceiling Plates:**

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1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

**D. Firestopping:**

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

**E. Flashing:**

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

**F. Hangers and Supports:**

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.
  - a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
    - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Note 3)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

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- 1) Note 1: Provide mid-story guides.
  - 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
  - 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.
- c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Steel Gas</u>	<u>Copper Brazen or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
  - 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
  - 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.
- d. Horizontal cast iron piping support spacing:
- 1) Support piping at every other joint for piping length of less than 4 feet.
  - 2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
  - 3) Hanger shall not be installed on the coupling.
  - 4) Provide support at each horizontal branch connection.
  - 5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
  - 6) Provide a brace on each side of a change in direction of 90 degrees or more.

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5. Suspended Piping:

- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Steel Connectors: Beam clamps with retainers.

6. Support to Structure:

- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
- 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062      MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through

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- 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
7. Rubber Neoprene Pipe Isolators:
- a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

**3.10 UNION AND FLANGE INSTALLATION**

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 6875.
- B. Install unions in piping NPS 2" and smaller, and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 6875.
- C. Locate the unions for easy removal of the equipment, tank, or valve.

**3.11 ACCESS DOOR INSTALLATION**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers,

traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### **3.12 CONCRETE WORK**

- A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.
- B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

### **3.13 PIPE PROTECTION**

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  - 1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
  - 2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  - 1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.



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- E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.
- F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer's recommendations and instructions.
- G. Sleeve cast iron and ductile iron pipe below grade and below slab with "Polywrap" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer's recommendations and instructions.
- H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

**3.14 PIPE IDENTIFICATION**

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Apply markings after painting and cleaning of piping and insulation is completed.

**3.15 EXPANSION ANCHORS IN HARDENED CONCRETE**

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.

- D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

### **3.16 PIPING SYSTEM PRESSURE TESTING**

- A. General:
  - 1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
  - 2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:
  - 1. Authority having jurisdiction shall witness tests of piping systems.
  - 2. Notify Architect at least seven days in advance of testing.
  - 3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
  - 4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
  - 5. Isolate from system equipment that may be damaged by test pressure.
  - 6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
    - a. Authority having jurisdiction shall witness final connection to system.
- C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.
- D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

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<u>System Tested</u>	<u>Test Pressure PSI</u>	<u>Test With</u>
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Natural Gas (PE)	60	Air & Non-corrosive Leak Test Fluid
Natural Gas (Steel)	100	Air & Non-corrosive Leak Test Fluid
Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

1. Flush deionized water lines with deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

**3.17 OPERATION OF SYSTEMS**

- A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
  1. Complete all requirements listed under "Check, Test and Start Requirements."
  2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  3. Filters, strainers etc. are in place.
  4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

**3.18 CHECK, TEST AND START REQUIREMENTS**

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

### **3.19 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS**

- A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
  2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Missing or damaged parts have been replaced.
  7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  10. Preliminary test and balance work is complete, and reports have been forwarded for review.
  11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.

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12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- D. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- E. Preliminary Operation:
1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

**3.20 CERTIFICATES OF INSTALLATION**

- A. Contractor shall complete applicable "Certificates of Installation" forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

**3.21 DEMONSTRATION AND TRAINING**

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

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1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
  - a. Listing of Owner-designated personnel completing training, by name and title.
  - b. Name and title of training instructor.
  - c. Date(s) of training.
  - d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Valves.
  - 3. Domestic water piping specialties.
  - 4. Gas piping specialties.
  - 5. Drain and waste piping specialties.

**1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 0050 Basic Plumbing Materials and Methods.

**1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

**1.4 INFORMATIONAL SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Provide welding certificate for all gas pipe welders.
- C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

**1.5 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

**1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

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**1.7 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.
- C. NFPA/ANSI Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."
- D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- E. Fabricate and install natural gas systems in accordance with California Plumbing Code.
- F. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

**PART 2 - PRODUCTS**

**2.1 MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

**2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS**

- A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.
- B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.
  - 1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at



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each floor and at 15 foot maximum intervals (also see Specification Section 22 0050).

- C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.
1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
  2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.
- D. Vent Pipe:
1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
  2. 2-1/2 inch and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
  3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.
- E. Type DWV copper tubing or No-Hub cast iron pipe and fittings may be used for concealed rainwater leaders. Where no-hub piping is used, the fittings and couplings shall match those used for waste piping.
- F. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 0050 for pipe protection requirements for below slab copper piping.
- G. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.
- H. Gas Pipe: Schedule 40 black steel conforming to ASTM A53, with malleable iron threaded fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.
1. Appliance Flexible Connectors for Indoor Equipment Without External Spring Isolation:
    - a. Contractor may choose one of the following:

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- 1) Direct gas pipe connection.
- 2) Appliance flexible connector:
  - a) Comply with ANSI Z21.24.
  - b) Polymer or hot-dipped PVC coated corrugated 304 stainless steel.
  - c) Operating-Pressure Rating: 0.5 psig.
  - d) End Fittings: Zinc-coated steel.
  - e) Maximum Length: 30 inches.
  - f) Manufacturers: Dormont, Series 30C, 31, 40C, 41, and 51, Brasscraft model ProCoat, or equal.
- b. Provide with end connections compatible with equipment and piping system.
- c. Equipment located in spaces normally accessible to building occupants, other than maintenance personnel, shall utilize direct gas pipe connection.

#### **I. Condensate Drain Piping:**

1. Inside buildings provide ASTM B88, Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.
2. Outside buildings provide ASTM B88, Type L copper pipe and fittings, cast iron drain pipe and fittings or Schedule 40 galvanized steel pipe and cast iron drain or vent fittings.
3. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
4. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide threaded metal connector at mechanical equipment, Metraflex Model SST, or equal by Unisource Mfg. Co., or Flexicraft Industries. Arrange flexible connection to ensure drainage of condensate, and support flexible connection at each end of connector, to ensure proper alignment.
5. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.
6. Provide cleanout tees or "Y" at each change in direction.

## **2.3 PIPE JOINING MATERIALS**

- A. Refer to piping Articles in this Section for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated

- a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
- b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
- 2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
- 3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
- 4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.
- D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
- E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## **2.4 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS**

- A. General:
  - 1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 6875.
    - a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.
      - 1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 6875.
- B. Gate Valves:
  - 1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
  - 2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
  - 3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
  - 4. Main distribution gate valves underground outside building above 1-1/2 inches:
    - a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
      - 1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
      - 2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.

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#### **C. Ball Valves:**

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

#### **D. Calibrated Balancing Valves:**

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating pressure.
  - a. Body: Brass.
  - b. Ball: 304 Stainless Steel.
  - c. Seat: Glass and Carbon filled TFE.
  - d. End Connections: Threaded.
  - e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
  - f. Handle Style: Dial, with memory stops to retain set position.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. 1 inch and smaller: Bell & Gossett model CB, "LF" series.

## **2.5 VALVES AND FITTINGS FOR GAS SYSTEMS**

#### **A. Gate Valves:**

1. 2-1/2 inches and smaller: Class150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.

#### **B. Gas Shut-off Valve Above Grade:**

1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

## **2.6 DOMESTIC WATER PIPING SPECIALTIES**

#### **A. Hose Bibbs:**

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1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Acorn Engineering Co.
  - b. Woodford Manufacturing Co.
2. Hose Station: Leonard THS-25-VB-CW, Symmons, or equal.

**B. Wall Hydrants:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Acorn Engineering Co.
  - b. Woodford Manufacturing Co.
  - c. Mifab, Inc.

**C. Water Hammer Arrestors:**

1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 6875, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Josam Company, series 75000.
  - b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
  - c. Mifab, series WHB.

**D. Thermostatic Water Temperature Control Valve:**

1. Provide thermostatic water temperature control valve conforming to lead free requirements of California Health and Safety Code Section 11 6875, with size as noted on Drawings, complete with union angle strainer checkstops. Valves shall be thermostatic type, with a maximum temperature setting as follows:
2. Provide surface semi-recessed mounted, stainless steel cabinet with locking door for control valves. Including:
  - a. Control valve cabinet and valve shall be provided as a package, and include thermostatic water mixing valve, thermometer, safety checkstops, volume control valve and internal piping.

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3. Where indicated on drawings, provide a temperature alarm system, utilizing a micro-processor based controller and solid state temperature controller. Provide audible and visual indication of high and low temperature set points. Provide required hardware and wiring for a complete operating system.
  - a. Provide isolation transformer for control of the alarm system.
  - b. Provide solenoid valve and shock absorber, installed and wired to the alarm module.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Leonard Valve Company.
  - b. Lawler Manufacturing Co., Inc.
  - c. Powers.

#### **E. Relief Valves:**

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Watts Regulator Company.
  - b. Cash (A.W.) Valve Manufacturing Corporation.
  - c. Zurn Industries, Inc.; Wilkins-Regulator Division.

## **2.7 DRAIN AND WASTE PIPING SPECIALTIES**

#### **A. Cleanouts:**

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
  - a. Provide cleanouts in waste drop from each sink and urinal.
  - b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.
2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.

3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.
  - a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
  - b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

**B. Floor Drains:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

**C. Floor Sinks:**

1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

**D. Hopper Drains:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Zurn.
  - b. J.R. Smith.

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.
- B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.
- C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.
- D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

**3.2 INSTALLATION OF WATER PIPING**

- A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.
- B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
  - 1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
  - 2. Install water hammer arresters above accessible ceilings, or install access doors for service.
- C. In freezing locations arrange water piping to drain as shown.
- D. Install piping on room side of building insulation.
- E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

**3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS**

- A. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved.



Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

- B. Storm Drain Piping: Run all horizontal storm drain piping inside of building on a uniform grade of not less than 1/4 inch per foot. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.
- C. Install rainwater leader nozzles at exposed bottom of leaders where they spill onto grade.
- D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.
- E. Grade all vent piping so as to free itself quickly of any water condensation.
- F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.
- G. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.
- H. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

#### **3.4 INSTALLATION OF NATURAL GAS PIPING**

- A. Install natural gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.
- B. Use sealants on metal gas piping threads that are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.
- D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.
- E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.
- F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.
- G. Install drip-legs in gas piping where indicated and where required by code or regulation.
  - 1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.
  - 2. Where gas supply is connected to equipment with flexible connectors, install drip-leg in piping on downstream side of flexible connector, and install shut off valve on piping on upstream side of flexible connector.
- H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.

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- I. Install piping parallel to other piping.
- J. Paint all gas piping installed in exposed exterior locations. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods, article, Painting.
- K. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: "Gas Shut-Off." Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.
- L. Provide watertight Schedule 40 PVC conduit to protect gas piping installed below covered walk, covered driveways, and where noted on Drawings. Extend sleeve at least 12 inches beyond any area where it is required to be installed, and terminate with valve box extended to grade, and marked "GAS".

### **3.5 PIPE JOINTS AND CONNECTIONS**

- A. General:
  - 1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
  - 3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
- B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- D. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
  - 1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.
- E. Cast Iron Soil Pipe:
  - 1. No-Hub fittings shall be made with a torque wrench.
  - 2. Hub joints shall be with Ty-Seal couplings.

3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

F. Welded Pipe:

1. Make up with oxyacetylene or electric arc process.
2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

### **3.6 INSTALLATION OF VALVES**

A. Install valves as indicated on Drawings and in the following locations:

1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph "Butterfly Valves" may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph "Ball Valves" may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:

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- a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
  - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- D. Silent Check Valves: Install in horizontal or vertical position between flanges.
- E. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers' recommendations, including requirements for straight pipe lengths at valve inlet and outlet.
- F. Gas Shut-Off Valves:
  - 1. Provide line size ball valve in gas line to each appliance.
- G. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### **3.7 INSTALLATION OF CLEANOUTS**

- A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

### **3.8 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS**

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

### **3.9 EQUIPMENT CONNECTIONS**

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

### **3.10 DOMESTIC WATER SYSTEM STERILIZATION**

- A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.

1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

**3.11 CARE AND CLEANING**

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

**3.12 OPERATIONAL TESTS**

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

**3.13 TESTING AND BALANCING**

- A. See Section 23 0593 of Specifications for testing and balancing requirements.

**3.14 CLEANING UP**

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Water supplies and stops.
  - 2. Plumbing fixture hangers and supports.

**1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 0050 Basic Plumbing Materials and Methods.

**1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Refer to Section 22 0050, Basic Plumbing Materials and Methods.

**1.5 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

**1.6 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:
  - 1. California Building Code – CBC
  - 2. California Plumbing Code – CPC
  - 3. California Health and Safety Code
  - 4. American National Standards Institute - ANSI
  - 5. Federal Standards - F.S.

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- 6. National Sanitary Foundation – NSF International
- C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”
- D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.
- E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.
- F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.
- G. Americans with Disabilities Act (ADA).
- H. California Green Building Standards Code Requirements:
  - 1. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

**PART 2 - PRODUCTS**

**2.1 PLUMBING FIXTURES**

- A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.
  - 1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
  - 2. Take location and mounting heights for roughing-in from Architectural Drawings.
  - 3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
  - 4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

**2.2 MATERIALS**

- A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
- B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

- C. Handles on all faucets and stops shall be all metal chromium plated.
- D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

### **2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES**

- A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
  - 1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.
- B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.
- C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.
- D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.
- F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.
- G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

### **2.4 MANUFACTURERS**

- A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.
- B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:
  - 1. Vitrified China Plumbing Fixtures:
    - a. American Standard, U.S. Plumbing Products.
    - b. Eljer Plumbingware Div., Wallace-Murray Corp.
    - c. Kohler Co.
    - d. VitrA.



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**2.5 FIXTURE CONNECTIONS**

- A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.
- B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Dearborn Brass, Commercial series with brass nuts.
    - b. Delta Commercial.
    - c. McGuire Manufacturing Co., Inc.
- C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.
- D. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

**2.6 WATER SUPPLIES AND STOPS**

- A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 6875, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.
- B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.
- C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.
- D. Provide cast brass escutcheon.
- E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. McGuire Manufacturing Company, Inc., model LFH2167LK.
  - 2. T & S Brass and Bronze Works, Inc., model B-1305.

## **2.7 PLUMBING FIXTURES**

- A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.
- B. Special Requirements For Accessible Fixtures:
  - 1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
  - 2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded "closed-cell" vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

## **PART 3 - EXECUTION**

### **3.1 PRODUCT HANDLING AND PROTECTION**

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

### **3.2 PREPARATORY PROVISIONS**

- A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

### **3.3 INSPECTION AND PREPARATION**

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

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- D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.
- E. Refer to Division 26 for wiring for electronic flush valves.

#### **3.4 FAUCET INSTALLATION**

- A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 11 6875, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.
- B. Adjust metering faucets to run for 10 to 15 seconds.

#### **3.5 CLEAN AND PROTECT**

- A. Clean plumbing fixtures of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.
- C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

#### **3.6 FIELD QUALITY CONTROL**

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

#### **3.7 EXTRA STOCK**

- A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Electric motors.
  - 2. Motor starters.
  - 3. Access Doors.
  - 4. Expansion loops.
  - 5. Flexible joints.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 23 Section.
- C. Refer to Section 23 0800.13, T-24 Commissioning of HVAC for Title 24 commissioning requirements.

### **1.3 ADDITIONAL REQUIREMENTS**

- A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.
- C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

### **1.4 REFERENCES AND STANDARDS**

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. AABC - Associated Air Balance Council
  - 2. AFBMA - Anti Friction Bearing Manufacturer's Association
  - 3. AMCA - Air Moving and Control Association Inc.
    - a. Standard 210 - Laboratory Methods of Testing Fans
  - 4. ANSI - American National Standards Institute
  - 5. ARI - Air-Conditioning and Refrigeration Institute

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6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME - American Society of Mechanical Engineers
8. ASTM - American Society for Testing and Materials
9. CCR - California Code of Regulations
  - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
10. CSA – Canadian Standards Association International
11. CSFM - California State Fire Marshal
12. NCPWB - National Certified Pipe Welding Bureau
13. NIST - National Institute of Standards and Technology
14. NEMA - National Electrical Manufacturers' Association
15. NFPA - National Fire Protection Association
16. OSHA - Occupational Safety and Health Act
17. SMACNA - Duct Manuals
18. UL - Underwriters' Laboratories, Inc.

**B. Requirements of Regulatory Agencies:**

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
  - a. California Building Code, 2022.
  - b. California Electrical Code, 2022.
  - c. California Energy Code, 2022.
  - d. California Fire Code, 2022.
  - e. California Green Building Standards Code, 2022.
  - f. California Mechanical Code, 2022.
  - g. California Plumbing Code, 2022.
  - h. California Code of Regulations, Title 24.
  - i. California Health and Safety Code.
  - j. CAL-OSHA.
  - k. California State Fire Marshal, Title 19 CCR.
  - l. National Fire Protection Association.
  - m. Occupational Safety and Health Administration.
  - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

**1.5 DRAWINGS**

- A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

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- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
  2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
  3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

**1.6 FEES AND PERMITS**

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
- C. Coordination:
1. General:
    - a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
  3. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

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- 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
  - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
  - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
4. Mechanical Coordination:
- a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
  - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
  - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
  - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

**1.7 SUBMITTALS - GENERAL**

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.

6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
  - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
  - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
  - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.
  1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

## **1.8 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.



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1. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
3. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
  - a. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
  - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2019 California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

**1.9 INFORMATIONAL SUBMITTALS**

- A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 8000.
- B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.
- C. Check, Test, and Start forms, from equipment manufacturers.
- D. Check, Test and Start reports.

**1.10 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:

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1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
    - 6) Copies of guarantees/warranties for each item of equipment or systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Temperature control diagrams and literature.
    - 11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
    - 12) Commissioning and Preliminary Operation Tests required as part of the Work.
2. Post service telephone numbers and addresses in an appropriate place designated by Architect.

**B. Record Drawings:**

1. Refer to Division 01 for additional requirements.
2. Upon completion of the Work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.
  - b. One complete set of reproducible drawings showing the Work exactly as installed.
  - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
  - d. Provide Contractor's signature, verifying accuracy of record drawings.
  - e. Obtain the signature of the Inspector of Record for Record Drawings.

**1.11 SUBSTITUTIONS**

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

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- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  - 1. Reason for substitution request.
  - 2. Complete submittal information as described herein; see "Submittals."
  - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  - 5. Explanation of impact on connected utilities.
  - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.
- G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

**1.12 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.
- C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.
- D. All materials and products shall be new.

**1.13 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

**1.14 FIELD CONDITIONS**

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

**1.15 WARRANTY**

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum,.
- C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

**2.2 MATERIALS**

- A. No material installed as part of this Work shall contain asbestos.
- B. California Green Building Code Compliance:
  - 1. HVAC and refrigeration equipment shall not contain CFCs.
  - 2. HVAC and refrigeration equipment shall not contain Halons.

**2.3 ELECTRIC MOTORS**

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. U.S. Motors.
  - b. Century Electric.
  - c. General Electric.
  - d. Lincoln.
  - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
  1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
  1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
  2. Motors Used with Variable Frequency Controllers:
    - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
    - c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
    - f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split phase.
  - c. Capacitor start, inductor run.
  - d. Capacitor start, capacitor run.
3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:
  - a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.
    - 1) Exceptions:
      - a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
      - b) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.
4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
7. Motors 1/20 HP and Smaller: Shaded-pole type.
8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

## **2.4 MOTOR STARTERS**

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
  1. All starters shall have the following:
    - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.

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- b. Ambient compensated thermal overload.
  - c. Fused control transformer (for 120 or 24 volt service).
  - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

**2.5 ACCESS DOORS**

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.
- E. Provide insulated doors where located in internally insulated ducts or casings.
- F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## **2.6 THERMAL AND SEISMIC EXPANSION LOOPS**

- A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend. Return bend section shall have support lug and plugged FPT drain. Flexible hose shall consist of corrugated metal inner hose and braided metal outer sheath. Assemblies shall be constructed from materials compatible with the fluid or gas being conveyed and shall be suitable for the system operating pressure and temperature. Provide assembly selected for 4 inches of movement.
- B. Assembly shall be suitable for use with R-410A refrigerant. Provide assembly without drain, cleaned, capped, and labeled for specific use.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Metraflex Inc., Metraloop series, or comparable product by one of the following, or equal:
  - 1. Flexicraft Industries.

## **2.7 FLEXIBLE JOINTS**

- A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.
- B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

## **2.8 PIPE GUIDES**

- A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

## **2.9 EQUIPMENT IDENTIFICATION**

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## **2.10 PIPE IDENTIFICATION**

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legend and flow arrow shall conform to ASME A13.1.



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**PART 3 - EXECUTION**

**3.1 EXISTING MATERIALS:**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

**3.2 FRAMING, CUTTING, AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

**3.3 MECHANICAL DEMOLITION**

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.

3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
  4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### **3.4 ELECTRICAL REQUIREMENTS**

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### **3.5 PIPING SYSTEM REQUIREMENTS**

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

### **3.6 PRIMING AND PAINTING**

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. Priming and painting:
  1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

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- a. Black Steel Piping:
  - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

**3.7 EXCAVATING**

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.
- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

### **3.8 BACKFILLING**

- A. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- B. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- C. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

### **3.9 PIPING AND DUCT SYSTEMS INSTALLATION**

- A. General:
  - 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
  - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
  - 3. Install piping to permit application of insulation and to allow valve servicing.
  - 4. Where piping, conduit, or ductwork is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
  - 5. Horizontal runs of pipes, conduits, or ductwork suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
  - 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
  - 7. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component opening shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency.
  - 8. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
  - 9. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
  - 10. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
  - 11. Install horizontal valves with valve stem above horizontal.

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12. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
13. Verify final equipment locations for roughing-in.
14. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
15. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

**B. Expansion Loops:**

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.
4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

**C. Sleeves:**

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

**D. Floor, Wall, and Ceiling Plates:**

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

**E. Firestopping:**

1. Pack the annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or

floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with CBC requirements.

3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Firestopping systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

**F. Flashing:**

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues, ducts, and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Elmdor/Stoneman Model 1540.
  - c. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4.

**G. Hangers and Supports:**

1. General: Support ductwork, equipment and piping so that it is firmly held in place by approved iron hangers and supports, and special hangers. Hanger and support components shall support weight of ductwork, equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping or ductwork with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping and ductwork support spacing, provide

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“bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

- a. Materials, design, and type numbers for support of piping per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
  - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
- b. Materials and design for ductwork support shall be per SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Copper Brazed or Soldered (Notes 3, 4)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

- 1) Note 1: Provide mid-story guides.
- 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 4) Note 4: Includes refrigerant piping, including vapor and hot gas pipes.
- b. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

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<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Copper Brazed or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.

5. Suspended Piping:

- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturers' published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.



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- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Above Roof: H frame made from Uni-Strut hot-dipped galvanized 1-5/8 inch single or double channel with P-2072A or P-2073A foot secured to roof and surrounded with waterproof roofed-in sleeper. Secure to sleeper with lag screws, and secure sleeper to blocking under roof.
- h. Steel Connectors: Beam clamps with retainers.
- 6. Duct Hanger and Support Spacing: Conform to Requirements of CMC and SMACNA "HVAC Duct Construction Standards, Metal and Flexible."
- 7. Support to Structure:
  - a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
    - 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062      MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
- b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.
- 8. Rubber Neoprene Pipe Isolators:
  - a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.

9. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
10. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
11. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
12. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
13. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.
14. On chilled or combination hot and chilled water or refrigerant pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

### **3.10 UNION AND FLANGE INSTALLATION**

- A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.
- B. Install unions in piping NPS 2" and smaller 3 or flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.
- C. Locate the unions for easy removal of the equipment, tank, or valve.
- D. Do not install unions or flanges in refrigerant piping systems.

### **3.11 ACCESS DOOR INSTALLATION**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### **3.12 PIPE PROTECTION**

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

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2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. holiday detector, or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

**3.13 PIPE IDENTIFICATION**

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
  1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.
- E. Apply the markings after painting and cleaning of piping and insulation is completed.

**3.14 TRACER WIRE INSTALLATION**

- A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.
- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

**3.15 OPERATION OF SYSTEMS**

- A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
  - 1. Complete all requirements listed under "Check, Test and Start Requirements."
  - 2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  - 3. Filters, strainers etc. are in place.
  - 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  - 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.
- C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

**3.16 CHECK, TEST AND START REQUIREMENTS**

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
  - 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  - 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.

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3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

**3.17 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS**

- A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
  2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Damaged fins on heat exchangers have been combed out.
  7. Missing or damaged parts have been replaced.
  8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  11. Preliminary test and balance work is complete, and reports have been forwarded for review.
  12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
  13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

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1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
  3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Before handing over the system to Owner replace all filters with complete new set of filters.
- D. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- E. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- F. Preliminary Operation:
1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.
- G. Operational Tests:
1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
  2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
  3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
  4. Control systems shall be completely operable with settings properly calibrated and adjusted.

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5. Rotating equipment shall be in dynamic balance and alignment.
6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

H. Pre-Occupancy Building Purge:

1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.
2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

**3.18 DEMONSTRATION AND TRAINING**

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
  2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
    - a. Listing of Owner-designated personnel completing training, by name and title.
    - b. Name and title of training instructor.
    - c. Date(s) of training.
    - d. List of topics covered in training sessions.
  4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 PROJECT STANDARDS**

- A. Become familiar with the general layout of the facility. Provide the Engineer with a written report including hours worked, work accomplished, and work to be completed on the next shift. All reports shall be submitted at shift end to the Engineer.

### **1.2 PRE-PROJECT REPORT**

- A. Submit a pre-project document including findings and recommendations for cleaning of all air delivery system services. Provide photographic evidence of conditions found in duct work, components, and air handlers including lab reports. See Article 3.02 of this Section for establishment of existing contamination levels.

### **1.3 QUALITY ASSURANCE**

- A. Inspection, contamination evaluation, hygienic maintenance service, and monitoring probe installation shall be performed by a supervisor with a minimum of two (2) years experience in projects of equal or greater scope.
- B. Do not cause or allow any of the work to be covered up or enclosed until it has been inspected and approved by the engineer. Should any of the work be covered up or enclosed before such inspection, the contractor shall at his own expense, uncover the work, and after it has been inspected and approved, make all repairs with such materials as may be necessary to restore all his work to its original and proper conditions.

### **1.4 SAFETY**

- A. Contractor shall provide the Engineer with a copy of the safety manual or document utilized by the crew leader. Safety meetings shall be conducted on a daily basis before shift starts.

### **1.5 LAB REQUIREMENTS**

- A. The laboratory used shall be registered by the State of California. Contractor shall provide the Engineer with the laboratory analysis and reporting techniques to be used. All work provided by the laboratory to the Contractor shall be submitted in the project report as received from the lab.

### **1.6 CONSTRUCTION SCHEDULE**

- A. All work shall be performed during non-business hours of the facility. All HVAC systems shall be returned to normal operating conditions at the end of each shift. All work areas shall be cleaned up after each shift so to have no impact on normal operations of the facility or personnel. Refer to Division 1 of the specifications for approved work schedules.



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**PART 2 - EQUIPMENT**

**2.1 CLEANING EQUIPMENT**

- A. Provide equipment and materials for cleaning, repairing and inspection work including scaffolding, wire brushes, rotary brushes, filters, air lances, mechanical agitators, fiber optic borescopes, vacuums, or other equipment and materials necessary for workmen to perform work specified. Any chemical utilized in this project shall have a Material Safety Data Sheet (MSDS) submitted to the State before product usage.
- B. Should the cleaning methodology require power vacuuming, the Contractor shall provide HEPA filtered power vacuum(s) operating at a minimum of 16,000 C.F.M. at 21" P.S.I., 25 C.F.M. air compressor operating at 210# P.S.I.; electric power vent cleaner and reverse jet air flow nozzle, or similar equipment required to properly carry out the work. Suitable protective covering shall be provided by the Contractor in all areas of work operation. Any mechanical defects to be reported to the Engineer and logged.

**2.2 ACCESS DOORS**

- A. Galvanized steel access doors and frames in duct work and plenums shall be, as a minimum, of same thickness sheet metal as duct or plenum in which installed and shall be of the double paneled or hollow type. Doors in insulated ducts shall be set flush with the exterior insulation surface and shall be of the double panel insulated type with a minimum of one inch (1") thick insulation.
- B. Doors 72 inches and over in height shall have four hinges; doors 24" to 71" shall have three hinges and doors under 24" shall have two hinges. Access doors over 22" in height shall be equipped with two latches; doors 14" to 21" with one latch. Access doors which are 14" x 14" and smaller shall be removable (without hinges and shall have a minimum of two sash latch fasteners).
- C. Access doors to outside air, return air, mixed air and coil plenums for air handlers shall have operable handles both sides of door.
- D. All doors shall seal against neoprene gaskets. Door installations shall be made air tight on all supply, return and exhaust ducts, plenums and equipment with a four ounce, four inch (4") wide tape saturated with solvent lagging adhesive and firmly applied. Solvent shall be non-flammable. The stripping shall be applied prior to insulation repairs. All materials shall be 25/50 flame/smoke spread rated.
- E. Ceiling access shall be Karp Associates type Katr or equal. Ceiling access door shall be designed to provide access in the existing suspended ceiling that is part of the fire rated floor - ceiling assembly the combination of steel, wall board and ceiling tile shall maintain the fire resistive qualities of the existing ceiling.
- F. Ceiling access shall be 30 inches by 22 inches maximum. Duct access doors shall be a minimum of 14 x 12 inches unless further limited by duct size.
- G. The ceiling access doors shall be installed according to the manufacturer's recommendations.

- H. Ceiling access door frame shall be 16 gage steel and door shall be 18 gage steel.
- I. Door shall be recessed 1-1/2 inches to accommodate double thickness of wall board and matching ceiling tile.
- J. Door hinge shall be continuous piano hinge.
- K. Locks shall be screwdriver operated with 1 inch stainless steel cam and lock studs (or shall be key operated cylinder lock with automatic dust shutter) furnished with plastic grommet to protect hole made in wall board and tile.
- L. Finish shall be prime coat of rust inhibitive electrostatic powder, baked grey or white enamel.
- M. Refer to contract drawings for framing details.

### **2.3 SANITIZING FLUID**

- A. Microban X580, Dichlorothen, Certi-Phene, or equal. Sanitizing fluid shall be applied to all scope-related surfaces after cleaning.

## **PART 3 - HYGIENIC MAINTENANCE PROCESS**

### **3.1 TEMPORARY FILTER MEDIA (IF REQUIRED)**

- A. Prior to any cleaning, temporary filter media is to be fitted to those diffusers/grilles or they may be sealed with a minimum of 6 mil polyethylene sheeting. All openings shall be suitably protected to avoid contamination and debris from entering the conditioned air spaces.

### **3.2 ESTABLISHMENT OF EXISTING CONTAMINATION LEVELS**

- A. As directed by the Engineer to evaluate existing contamination levels, Contractor shall take samples of contaminants within the duct work and in other strategic locations to track contaminants throughout the air delivery system. Particulate samples shall be gathered with sterile swabs and then analyzed for general identification. Microbial samples shall be collected by utilizing HYCON Contact Slides. Culturing methodology shall conform to manufacturer's specifications and requirements. Molds and Bacteria are the general microbial constituents to be sampled for at designated areas. Samples shall be clearly identified in the Pre and Post-Project Reports as to sampling locations. In addition, photographs shall be taken of these sample locations for documentation in the Pre and Post-Project Reports.
- B. Sample Locations
  - 1. 4 Supply duct
  - 2. 1 Mixing box (if any exist)
  - 3. 1 Return air duct
  - 4. 1 Air handling unit (coil area)
  - 5. 4 Ceiling return air plenum

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- C. Locations are to be sampled for ea/ Air Handling Unit System & related ductwork, as a minimum.
- D. Particulate Samples (Wipes): Shall be analyzed using microscopic techniques to identify general content; i.e. rust, fibrous, carbon, crystalline, etc. These will assist in tracking movement of material within the system and the areas of breakdown.
- E. Microbial Samples: Use Hycon agar contact surface slides to identify general levels of mold and bacteria present. Results shall be expressed in total CFU's (Colony Forming Units).
- F. Verification of Systems Cleaning: Shall be established initially by NADCA (National Air Duct Cleaning Association) Standards.

**3.3 DUCTWORK CLEANING PROCESS**

- A. Cleaning Methodology Option #1:
  - 1. Contractor shall install access ports into all supply and return ductwork at 15 feet maximum intervals. Access ports shall be a permanent reusable system 50 mm round or provide access doors that conform to Article 2.02 of this Section. All related duct work must not be cut into for cleaning purposes other than to install access points. The structural integrity of the duct work shall not be altered by access system installation. The duct access ports shall be installed with sheet metal screws onto the outside of the duct.
    - a. When access points are installed in concealed attic areas, visual checks are to be made of the condition of both the external duct insulation and the ducts themselves at "T" joints, etc. Where breaks in either insulation or duct work are found, these are to be documented and submitted as found.
    - b. After the work is done, the duct penetration (through the access port) shall be closed airtight with a threaded plug screwed into the access port.
  - 2. Prior to the start of the cleaning process the fan powered HEPA filtered collection devices shall be securely connected to the supply outlets to be treated. Sufficient negative pressure shall be generated within the designated duct runs to ensure all particulate contamination is removed and contained under controlled conditions.
  - 3. By inserting special air lances, mechanical agitators or rotary brushes through the installed access points, gently remove all loose contaminants from the interior surfaces of the duct work. Where duct work has internal insulation or other fragile components, take precautions not to disrupt or damage these sensitive areas. Under no circumstances shall any workers be allowed to climb inside of the duct work onto any fragile internal surfaces or components.
  - 4. Fan powered, high efficiency dust and particulate collection systems shall be utilized in areas where contaminants are being removed from the system. Contractor shall take all necessary precautions to prevent dirt and debris from entering the conditioned areas. The collection systems shall be a self-contained unit, with appropriate components to adequately prevent dirt and debris loosened from upstream duct mains and branches during cleaning operations from entering the conditioned spaces by capturing this debris within the collection device. The filter(s) utilized in the collection systems shall be an industrial grade

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type, labeled and certified HEPA filter to be no less than 99.97 percent efficient on particles of 0.3 microns and greater at rated flow.

**B. Cleaning Methodology Option #2:**

1. All ducts shall be thoroughly cleaned by power vacuuming. Ductwork that does not allow complete access shall be entered by means of access doors as described in Article 2.02 of this Section.

**C. All ducts shall be inspected as work proceeds. Any defects in the duct system found during the cleaning process shall be immediately brought to the attention of the Engineer. All minor repairs such as caulking, sealing, and reconnecting shall be performed as part of the contracted scope of work.**

1. Caulking or sealing compound:
  - a. 3-M No. 900 duct sealer, Tuff Bond No. 29, Permacel No. EZ-4719, Foster 32-14, United Duct Sealer, or equal.

**D. Doors shall be installed at selected locations so as to accommodate the complete cleaning of the ductwork systems but not exceeding 10 foot intervals.**

**E. Internal Lining or Fiberglass Manufactured Ducts:**

1. Where supply ducts have either internal lining (fiberglass) insulation or are fiberglass manufactured ducts, the internal surfaces shall be coated, to control surface breakdown. Apply second coating, if required, to ensure complete encapsulation. Coating shall meet 25/50 flame and smoke spread as tested in accordance with ASTM E84.

**F. Grilles, Registers, and Diffusers:**

1. Whenever the grilles, registers and diffusers are removable, they shall be removed, vacuum cleaned, washed, dried and then reinstalled. Non-removable grilles, registers, and diffusers shall be cleaned in place.

**G. Duct Coils:**

1. Clean duct coils by air washing and brushing to ensure all contaminants are removed from between the fins. If fins are bent prior to cleaning, utilize a coil combing system to straighten fins as best as possible.

**3.4 DUCT COIL CLEANING PROCESS**

- A. Duct mounted coils shall be hand washed (air or water) on both coil faces carefully to avoid damage to tubes and fins. Thoroughly clean coil faces ensuring contaminants are removed. Remove corrosion from around coil frames; hand brush and vacuum clean. Paint all corroded metal frame surfaces. Where necessary, recomb coil fins to restore them to original condition. Before cleaning process begins on both sides of the coil perform before and after pressure readings.**

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**3.5 DAMPER, MOTOR, TURNING VANES AND LINKAGE CLEANING AND REPAIR  
PROCESS**

- A. Control dampers for air handling systems, duct-mounted volume, fire and zone dampers, and turning vanes shall be inspected, cleaned and repaired. Mark dampers to their current setting. Contractor shall assume one volume damper per branch and that 50% are not functioning and will require major repairs or replacement.
- B. Repairs shall include straightening and aligning of vanes, blades and linkages.
- C. All related equipment shall be power vacuumed and high pressure washed where required.
- D. Areas with rust or scale build-up shall be wire brushed or scraped.
- E. All damper motors and linkages shall be lubricated and set into their original position upon completion of work. Lubricant material - Aerolex Dry Moly, or equal.

**3.6 MIXING BOX CLEANING AND REPAIR**

- A. Mixing boxes shall be cleaned. Work on each unit includes the following:
  - 1. Remove access panel from the base of mixing box, taking precautions not to disturb wires, cables, or setting of appurtenances of each mixing box or appurtenances adjacent to box.
  - 2. Remove loose contamination from the internal areas of the box.
  - 3. Repair patch all damaged insulation where necessary with Linacoustic fiber glass duct liner or equivalent. All insulation shall have as a minimum 1 inch thickness.
  - 4. After the removal of all loosened contaminants is completed and damaged insulation is repaired, the coating shall be carried out. Coat all insulated surfaces of the box interiors with a insulation sealant; Fosters 30-36, or equal. Apply second coating, if required, to ensure complete encapsulation.
  - 5. Actuators, linkages and dampers on all boxes shall be inspected and repaired. It is estimated 75% or more of the boxes need repair.

**3.7 EQUIPMENT ROOMS AND AIR PLENUM CLEANING PROCESS**

- A. Related air plenums and/or equipment room locations that are within the airstream of this project shall be thoroughly cleaned and sanitized utilizing lead dust cleanup procedures. Such work except ceiling return air plenums shall include the following:
- B. Remove all water from floor area, note leaks; report on pipe work conditions. Vacuum clean all surfaces, including walls, floors, and ceiling surfaces. All other debris shall be removed from the area by the Contractor. Plenum areas shall be visually inspected and sealed air-tight with an approved caulking compound.
- C. All supply duct lining shall be coated as in paragraph 3.03F.
- D. Remove all corrosion from all metal areas by scraping, sanding, or wire brushing.

- E. Contractor has the responsibility to ensure that all areas are left in a correct operating mode; all switches, lights, doors, hatches, and controls are returned to their original setting.
- F. Contractor shall, at the end of each shift, remove all waste dirt and debris resulting from the work performed.

### **3.8 AIR HANDLING UNIT CLEANING PROCESS**

- A. The air handling units shall be cleaned. Prior to work commencement, a pre-arranged schedule shall be established with the State Construction Supervisor. Work on each unit includes the following:
  - 1. Fresh air plenums shall be cleaned thoroughly. Inlet louvers, mixing dampers, and turning vanes, if corroded, shall be scraped, primed, and top coated as necessary. All debris shall be removed from plenum areas and concrete floors thoroughly cleaned to remove surface debris.
  - 2. Remove air filters. If metal is corroded, hand scrape, prime, and top coat the filter holding frames.
  - 3. Hand wire brush all areas of side, roof, and ceiling panels as necessary.
  - 4. Remove all corrosion from around coil frames and drain pans; hand brush and vacuum clean.
  - 5. Paint affected areas of coil frames, using a zinc rich primer and enamel top coat paint.
  - 6. Heating and Cooling Coils:
    - a. Prior to cleaning of coils, take a pressure reading on both sides of the coil while system is in operation. Take identical readings after the coil is cleaned; note pressure change and submit findings.
    - b. Cleaning will consist of washing downstream of coil first and then upstream utilizing a high pressure water cleaning system with a suitable biodegradable cleaning agent, thoroughly cleaning coil faces ensure all contaminants and materials are removed. Take precautions not to damage coil fins. If fins are bent prior to cleaning, straighten (as best as possible) fins utilizing a coil combing system. High power wash will be performed with a water spray device that delivers a minimum of 500 PSI. Detergent cleaning shall be followed by thorough rinsing with fresh water. Any degreasing of the coils shall be performed before final cleaning to ensure complete removal of any residual build-up.
    - c. Drain pans are to be cleaned and cleared before any pressure washing be performed, thus assuring complete and safe drainage.
  - 7. Vacuum clean and hand wash fan casing, motors and fan wheels so that all grease and debris is removed. A degreasing solution shall be used in areas where required.
  - 8. Hand scrape fan impellers and remove all loose contaminants from within the fan casing.
  - 9. Where insulation is damaged or fragile, repair patch as necessary. If the insulation facing is damaged non-existent, the facing shall be coated.
  - 10. Report all locations where access doors are missing and filter housings damaged or destroyed to the engineer.

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**PART 4 - POST PROJECT REQUIREMENTS**

**4.1 MONITORING PROGRAM AND WARRANTY**

- A. Provide one (2) year warranty of all work, dated from the project completion date. Provide quarterly visual inspections during the warranty period in 4 different areas of the building. Set up monitoring probes as required.

**4.2 POST PROJECT REPORT**

- A. Submit a post-project report within 45 calendar days of the completion of the project. The report shall summarize the project, contrast contamination levels of the sampling locations in the pre-project report, and provide photographic evidence documenting the results of the project (see Article 3.02 B of this Section).
- B. Record mechanical defects, insulation encapsulation, pressure readings from coils, and all air delivery system improvements. Provide photographic documentation of all information.
- C. Provide a record drawing showing the exact installed positions of all access doors and access ports.

**PART 5 - MISCELLANEOUS**

**5.1 CLEAN UP PROCEDURES**

- A. Upon completion of work, and at the end of each shift, clean up the assigned work area of all trash, rubble, rags, containers, materials, and equipment resulting from work on this contract, and remove same from the premises at no additional cost.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
  - 2. Balancing Domestic Water Piping Systems.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.3 REFERENCES AND STANDARDS**

- A. Associated Air Balance Council (AABC)
  - 1. National Standards for Total System Balance, latest edition.
- B. National Environmental Balancing Bureau (NEBB)
  - 1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

### **1.4 DEFINITIONS**

- A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications



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and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

- B. Similar Terms: The following table is provided for clarification only:

<u>Similar Terms</u>		
<u>Contract Term</u>	<u>AABC Term</u>	<u>NEBB Term</u>
TAB Specialist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

- C. AABC: Associated Air Balance Council.
- D. NEBB: National Environmental Balancing Bureau.
- E. TAB: Testing, adjusting, and balancing.
- F. TAB Organization: Body governing practices of TAB Specialists.
- G. TAB Specialist: An entity engaged to perform TAB Work.

**1.5 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.

**1.6 INFORMATIONAL SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
1. Provide list of similar projects completed by proposed TAB field supervisor.
  2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.

- C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
  - 1. Submit examinations report with qualifications data.
- D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.
- F. Certified TAB reports.
  - 1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.
    - a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

#### **1.7 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

#### **1.8 QUALITY ASSURANCE**

- A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC NEBB.
  - 1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.

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- B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:
  - 1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC NEBB.
    - a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.
  - 2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC NEBB as a TAB technician.
    - a. TAB technician shall have minimum 4 years TAB field experience.
- C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.
- D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.
- E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.
  - 1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.
- F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.
- G. TAB Standard:
  - 1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:
    - a. AABC National Standards for Total System Balance
    - b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
  - 2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
  - 3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.
- H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project

requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:
    - a. The Contract Documents examination report.
    - b. The TAB plan.
    - c. Coordination and cooperation of trades and subcontractors.
    - d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.
  2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.
- I. Certify TAB field data reports and perform the following:
1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect.
- K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

## **1.9 WARRANTY**

- A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:
1. AABC Performance Guarantee.
  2. NEBB Quality Assurance Program.
- B. Refer to Division 01 Specifications for additional requirements.

## **1.10 COORDINATION**

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- C. Coordinate TAB work with work of other trades.

## **PART 2 - PRODUCTS (Not Applicable)**

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Contract Documents Examination Report:
  - 1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:
    - a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
    - b. Proposed corrective action necessary for proper system operation.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine system pumps to ensure absence of entrained air in the suction piping.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Report conditions requiring correction discovered before and during performance of TAB procedures.

- N. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### **3.2 PREPARATION**

- A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:
  - 1. General description of each air system and sequence(s) of operation.
  - 2. Complete list of measurements to be performed.
  - 3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
  - 4. Qualifications of personnel assigned to Project.
  - 5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc).
  - 6. Air terminal correction factors for the following:
    - a. Air terminal configuration.
    - b. Flow direction (supply or return/exhaust).
    - c. Effective area of each size and type of air terminal.
    - d. Air density.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.
  - 2. Automatic temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance, smoke, and fire dampers are open.
  - 5. Isolating and balancing valves are open and control valves are operational.
  - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

### **3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 0713

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"Duct Insulation," Section 23 0716 "HVAC Equipment Insulation," Section 23 8000 Heating, Ventilating, and Air Conditioning."

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

**3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS**

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.
- C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.
  - 1. Use state-of-the-art instrumentation approved by TAB specialists governing agency.
  - 2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.
- D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.
- E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- H. Verify that motor starters are equipped with properly sized thermal protection.
- I. Check dampers for proper position to achieve desired airflow path.
- J. Check for airflow blockages.
- K. Check condensate drains for proper connections and functioning.
- L. Check for proper sealing of air-handling-unit components.
- M. Verify that air duct system is sealed as specified in Section 23 8000 "Heating, Ventilating, and Air Conditioning."

- N. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.
- O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

### **3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS**

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
  - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  - 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.



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- B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.
- C. Check operation of outside air dampers. Measure total outside air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust outside air dampers to provide 100 percent outside air in economizer mode. Ensure that outside air dampers close completely upon unit shutdown.
- D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
  - 1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
  - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- E. Measure air outlets and inlets without making adjustments.
  - 1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.
- F. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
  - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.
  - 2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.
- G. Do not overpressurize ducts.

**3.6 PROCEDURES FOR HEAT EXCHANGERS**

- A. Measure water flow through all circuits.
- B. Adjust water flow to within specified tolerances.

- C. Measure inlet and outlet water temperatures.
- D. Measure inlet steam pressure.
- E. Check settings and operation of safety and relief valves. Record settings.

### **3.7 PROCEDURES FOR MOTORS**

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  - 1. Manufacturer's name, model number, and serial number.
  - 2. Motor horsepower rating.
  - 3. Motor rpm.
  - 4. Efficiency rating.
  - 5. Nameplate and measured voltage, each phase.
  - 6. Nameplate and measured amperage, each phase.
  - 7. Starter manufacturer's name, model number, size, type, and thermal-protection-element rating.
    - a. Starter strip heater size, type, and rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

### **3.8 PROCEDURES FOR CONDENSING UNITS**

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

### **3.9 PROCEDURES FOR HEAT-TRANSFER COILS**

- A. Measure, adjust, and record the following data for each electric heating coil:
  - 1. Nameplate data.
  - 2. Airflow.
  - 3. Entering- and leaving-air temperature at full load.
  - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
  - 5. Calculated kilowatt at full load.
  - 6. Fuse or circuit-breaker rating for overload protection.
- B. Measure, adjust, and record the following data for each refrigerant coil:
  - 1. Dry-bulb temperature of entering and leaving air.

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2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.

**3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS**

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  1. Measure and record the operating speed, airflow, and static pressure of each fan.
  2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  3. Check the condition of filters.
  4. Check the condition of coils.
  5. Check the operation of the drain pan and condensate-drain trap.
  6. Check bearings and other lubricated parts for proper lubrication.
  7. Report on the operating condition of the equipment and the results of the measurements taken. Report conditions requiring correction.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
  1. New filters are installed.
  2. Coils are clean and fins combed.
  3. Drain pans are clean.
  4. Fans are clean.
  5. Bearings and other parts are properly lubricated.
  6. Conditions requiring correction noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
  1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.

### **3.11 TOLERANCES**

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances: Plus 10 percent and minus 0 percent.
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent.
  - 2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent.
  - 3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for "Air Outlets and Inlets".
    - a. Room shall be balanced to create pressure relationship (positive, negative, or neutral) with adjacent spaces as indicated on Drawings. Maintain airflow differentials between supply, return, and exhaust indicated on Drawings.
- B. Set plumbing systems water flow rates within plus or minus 10 percent.

### **3.12 REPORTING**

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### **3.13 FINAL REPORT**

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
  - 2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
  - 3. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Pump curves.
  - 2. Fan curves.
  - 3. Manufacturers' test data.
  - 4. Field test reports prepared by system and equipment installers.

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5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
  2. Name and address of the TAB specialist.
  3. Project name.
  4. Project location.
  5. Project Performance Guaranty
  6. Architect's name and address.
  7. Engineer's name and address.
  8. Contractor's name and address.
  9. Report date.
  10. Signature of TAB supervisor who certifies the report.
  11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  12. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  13. Nomenclature sheets for each item of equipment.
  14. Data for terminal units, including manufacturer's name, type, size, and fittings.
  15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.
    - e. Fan drive settings including settings and percentage of maximum pitch diameter.
    - f. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
  2. Duct, outlet, and inlet sizes.
  3. Pipe and valve sizes and locations.
  4. Terminal units.
  5. Balancing stations.
  6. Position of balancing devices.

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- E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.
- F. Test Reports – General:
  - 1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.
- G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - j. Number, make, and size of belts.
    - k. Number, type, and size of filters.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total air flow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Filter static-pressure differential in inches wg.
    - f. Cooling-coil static-pressure differential in inches wg.
    - g. Heating-coil static-pressure differential in inches wg.
    - h. Outdoor airflow in cfm.
    - i. Return airflow in cfm.

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- j. Relief airflow in cfm.
  - k. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
  - l. Return-air damper position.
  - m. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
- H. Apparatus-Coil Test Reports:
- 1. Coil Data:
    - a. System identification.
    - b. Location.
    - c. Coil type.
    - d. Number of rows.
    - e. Fin spacing in fins per inch o.c.
    - f. Make and model number.
    - g. Face area in sq. ft.
    - h. Tube size in NPS.
    - i. Tube and fin materials.
    - j. Circuiting arrangement.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Average face velocity in fpm.
    - c. Air pressure drop in inches wg.
    - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
    - e. Return-air, wet- and dry-bulb temperatures in deg F.
    - f. Entering-air, wet- and dry-bulb temperatures in deg F.
    - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    - h. Refrigerant expansion valve and refrigerant types.
    - i. Inlet steam pressure in psig.
- I. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
- 1. Unit Data:
    - a. System identification.
    - b. Location.
    - c. Coil identification.
    - d. Capacity in Btu/h.
    - e. Number of stages.
    - f. Connected volts, phase, and hertz.
    - g. Rated amperage.
    - h. Air flow rate in cfm.

- i. Face area in sq. ft.
    - j. Minimum face velocity in fpm.
  - 2. Test Data (Indicated and Actual Values):
    - a. Heat output in Btu/h.
    - b. Air flow rate in cfm.
    - c. Air velocity in fpm.
    - d. Entering-air temperature in deg F.
    - e. Leaving-air temperature in deg F.
    - f. Voltage at each connection.
    - g. Amperage for each phase.
- J. Fan Test Reports: For supply, return, and exhaust fans, include the following:
  - 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - g. Number, make, and size of belts.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg.
- K. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:



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- a. System and air-handling-unit number.
  - b. Location and zone.
  - c. Traverse air temperature in deg F.
  - d. Duct static pressure in inches wg.
  - e. Duct size in inches.
  - f. Duct area in sq. ft..
  - g. Indicated air flow rate in cfm.
  - h. Indicated velocity in fpm.
  - i. Actual air flow rate in cfm.
  - j. Actual average velocity in fpm.
  - k. Barometric pressure in psig.
- L. Air-Terminal-Device Reports:
  - 1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Apparatus used for test.
    - d. Area served.
    - e. Make.
    - f. Number from system diagram.
    - g. Type and model number.
    - h. Size.
    - i. Effective area in sq. ft.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Air velocity in fpm.
    - c. Preliminary air flow rate as needed in cfm.
    - d. Preliminary velocity as needed in fpm.
    - e. Final air flow rate in cfm.
    - f. Final velocity in fpm.
    - g. Space temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Service.
    - d. Make and size.
    - e. Model number and serial number.
    - f. Water flow rate in gpm.

- g. Water pressure differential in feet of head or psig.
- h. Required net positive suction head in feet of head or psig.
- i. Pump rpm.
- j. Impeller diameter in inches.
- k. Motor make and frame size.
- l. Motor horsepower and rpm.
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. Full-load amperage and service factor.
- p. Seal type.
- 2. Test Data (Indicated and Actual Values):
  - a. Static head in feet of head or psig.
  - b. Pump shutoff pressure in feet of head or psig.
  - c. Actual impeller size in inches.
  - d. Full-open flow rate in gpm.
  - e. Full-open pressure in feet of head or psig.
  - f. Final discharge pressure in feet of head or psig.
  - g. Final suction pressure in feet of head or psig.
  - h. Final total pressure in feet of head or psig.
  - i. Final water flow rate in gpm.
  - j. Voltage at each connection.
  - k. Amperage for each phase.

N. Instrument Calibration Reports:

- 1. Report Data:
  - a. Instrument type and make.
  - b. Serial number.
  - c. Application.
  - d. Dates of use.
  - e. Dates of calibration.

### **3.14 INSPECTIONS**

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Measure water flow of at least 5 percent of terminals.
  - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

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- d. Verify that balancing devices are marked with final balance position.
- e. Note deviations from the Contract Documents in the final report.

**B. Final Inspection:**

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
- 2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
- 3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
- 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

**C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:**

- 1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
- 2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
- 3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

**D. Prepare test and inspection reports.**

**3.15 ADDITIONAL TESTS**

- A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Requirements for commissioning of HVAC systems for Title 24 (T-24) compliance.
- B. Scope: Commissioning Coordinator shall complete the building systems commissioning requirements of the California Energy Code, as applicable to Project. It is not the intention of Project specifications to require duplication in testing.
  - 1. T-24 commissioning activities may be coordinated with Contractor tests and TAB work specified in technical Sections.
  - 2. T-24 commissioning activities may be coordinated with LEED and CHPS program commissioning activities, as applicable to Project.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The requirements of this Section apply to all Sections of Division 23.
- C. In the event of conflict between requirements of Division 01 Title 24 commissioning specifications and this Section, Division 01 requirements shall prevail.

### **1.3 REFERENCES**

- A. 2022 California Energy Code.
- B. 2022 California Energy Code and Building Energy Efficiency Standards Reference Appendices.
- C. 2022 Building Energy Efficiency Standards Nonresidential Compliance Manual.

### **1.4 DEFINITIONS**

- A. Commissioning Coordinator: General Contractor, or an entity engaged by the General Contractor to perform T-24 commissioning.
- B. Covered Processes: Process equipment for which there are listed requirements in the California Energy Code.
- C. OPR: Owner's Project Requirements.
- D. TAB: Testing, Adjusting, and Balancing.

### **1.5 SUBMITTALS (FOR RECORD ONLY)**

- A. Submit the following:

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1. Commissioning Plan.
  2. Systems Manual.
  3. Commissioning Report.
  4. Certificates of Installation.
  5. Certificates of Acceptance.
- B. Above items for inclusion in closeout documents submitted to authorities having jurisdiction.

**PART 2 - PRODUCTS**

**2.1 TEST INSTRUMENTS**

- A. Commissioning Coordinator shall supply test instruments. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if recommended by instrument manufacturer, and be checked for accuracy prior to start of work.

**PART 3 - EXECUTION**

**3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES**

- A. Architect/Engineer:
1. Performs construction observation. Provides construction observation reports.
  2. Reviews and approves Commissioning Plan, Systems Manual, and Commissioning Report.
  3. Assists in problem resolution.
- B. Commissioning Coordinator:
1. Coordinates commissioning process.
  2. Develops Commissioning Plan.
  3. Schedules and conducts functional testing. Completes Certificates of Acceptance.
  4. Assembles Systems Manual.
  5. Schedules and conducts systems operations training. Verifies systems operations training completion.
- C. HVAC Subcontractor: Assists in functional testing.
- D. Electrical Subcontractor: Assists in functional testing.
- E. Controls Subcontractor: Assists in functional testing.
- F. TAB Subcontractor: Assists in functional testing.
- G. Equipment Manufacturers/Vendors:

1. Performs Check, Test, and Start of equipment and systems, as required by Project technical Sections.
2. Provides systems and equipment documentation required to complete functional testing and assemble Systems Manual.

### **3.2 COMMISSIONING PLAN**

- A. Commissioning Coordinator shall author the code-required Commissioning Plan. The Commissioning Plan shall address HVAC systems for which commissioning is required. The Commissioning Plan shall be updated by Commissioning Coordinator throughout the construction process. The Commissioning Plan shall contain the following:
1. General Project Information: Commissioning Coordinator shall obtain general Project information from Project architectural Drawings.
  2. Commissioning Goals:
    - a. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
    - b. Verify and document proper integrated performance of equipment and systems utilizing functional testing for mechanical system acceptance, as required by the California Energy Code.
    - c. Verify that Systems Manual documentation is complete.
    - d. Verify that operating personnel are trained to enable them to operate, monitor, adjust, and maintain HVAC systems in an effective and energy-efficient manner.
  3. Commissioning Coordinator shall compile the following information and include in Commissioning Plan:
    - a. An explanation of original design intent: Commissioning Coordinator shall obtain copies of the OPR and BOD for the Project.
    - b. Equipment and systems to be tested, including the extent of tests: Test 100 percent of a given type of installed equipment having associated Acceptance Requirements.
      - 1) Refer to forms MCH-01-E on Drawings for systems to be commissioned.
      - 2) Covered Processes: In addition to systems listed in MCH-01-E on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
        - a) Parking garage ventilation systems.
        - b) Compressed air systems.
        - c) Type 1 Kitchen exhaust systems.
    - c. Functions to be tested: Refer to 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
    - d. Conditions under which the test shall be performed.

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- e. Measureable criteria for acceptable performance: Refer to 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
- f. Commissioning team information:
  - 1) Refer to Project information on architectural Drawings for design team participants. Commissioning Coordinator shall add subcontractor information to provided design team information and include in Commissioning Plan.
- g. Commissioning process activities, schedules, and responsibilities. Plans for the completion of functional performance testing, systems operations training, and commissioning report.

**3.3 CERTIFICATES OF INSTALLATION**

- A. Commissioning Coordinator shall complete applicable Certificates of Installation forms.

**3.4 FUNCTIONAL TESTING REQUIREMENTS**

- A. Contractor shall complete the applicable Acceptance Requirements for Code Compliance contained in the California Building Energy Efficiency Standards. Refer to T-24 compliance forms on Drawings for systems having Acceptance testing requirements. Contractor shall perform Acceptance tests and complete the appropriate "Certificates of Acceptance." Contractor shall engage certified HERS Rater to verify duct leakage rate for duct systems indicated on T-24 compliance forms on Drawings as requiring duct leakage rate testing. For additional duct leak testing requirements, refer to Section 23 8000, "Heating, Ventilating, and Air Conditioning," Article, "Ductwork Sealing and Leak Testing."
- 1. Covered Processes: In addition to systems listed on T-24 compliance forms on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
  - a. Parking garage ventilation systems.
  - b. Compressed air systems.
  - c. Type 1 Kitchen exhaust systems.

**3.5 SYSTEMS MANUAL**

- A. Commissioning Coordinator shall assemble Systems Manual in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications.

**3.6 SYSTEMS OPERATIONS TRAINING**

- A. Commissioning Coordinator shall provide systems operations training in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications.

**3.7 COMMISSIONING REPORT**

- A. Commissioning Coordinator shall complete Commissioning Report in accordance with the requirements of the California Energy Code and Division 01 commissioning specifications.

**END OF SECTION**



**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes equipment and performance criteria for furnishing all labor and materials for the installation and programming for "Pelican" Energy Management System for HVAC Systems utilizing wireless communication with cloud based servers.

**1.2 RELATED SECTIONS:**

- A. Division 01: General Requirements
- B. Section 23: Heating, Ventilating, and Air-Conditioning (HVAC)

**1.3 SUBMITTALS:**

- A. Shop Drawings and product data in accordance with the specifications.
- B. All shop drawings shall be prepared in AutoCAD 2000 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.
- C. All submittals shall be bound or in a three ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or engineer for distribution and review.
- D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.
- E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.
- F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

**1.4 SCOPE OF WORK**

- A. Except as otherwise noted, the control system shall consist of all thermostats, and gateways to fill the intent of the specification and provide for a complete and operable system.

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- B. The EMS Contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.
- D. When the EMS system is fully installed and operational, the EMS Contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the EMS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
- E. The Contractor shall furnish and install a complete EMS control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install EMS controls for the HVAC Equipment as noted on the drawings:
- F. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and the owner's team.
- G. Contractor shall provide one training session in the operation of the system, for owner's personnel.
- H. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

**1.5 SYSTEM DESCRIPTION**

- A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.
- B. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner's wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

**1.6 WORK BY OTHERS**

- A. The EMS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. EMS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.
- B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by the Mechanical Contractor. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's installation instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum 3 conductor / 24 gauge wires per EMS manufacturer's standard specifications, multiple c conductor/24 gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)
- C. Related work provided by others:
  - 1. 110 V outlets shall be provided within 5 feet of each gateway location.
  - 2. 1 Data port shall be provided within 10 feet of each gateway location.
- D. Equipment start-up and servicing

**1.7 CODE COMPLIANCE**

- A. Provide EMS components and ancillary equipment which are code compliant.
- B. All wiring shall conform to the National Electrical Code.
- C. All products of the EMS shall reside with the following agency approvals.
  - 1. California 2022 Title 24 Compliant.
  - 2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
  - 3. OpenADR2.0 certified.

**1.8 SYSTEM STARTUP AND COMMISSIONING**

- A. Each EMS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the EMS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

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- B. The EMS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The EMS Contractor shall have a trained technician available on request during the balancing of the systems. The EMS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to EMS.

**1.9 TRAINING**

- A. The EMS Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The EMS Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description:
- B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
  - 1. System Overview
  - 2. System Software and Operation
  - 3. System access
  - 4. Software features overview
  - 5. Changing set points and other attributes
  - 6. Scheduling
  - 7. Editing programmed variables
  - 8. Displaying color graphics
  - 9. Running reports
  - 10. Workstation maintenance
  - 11. Application programming
  - 12. Operational sequences including start-up, shutdown, adjusting and balancing.
  - 13. Equipment maintenance

**1.10 OPERATING AND MAINTENANCE MANUALS**

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire EMS. This documentation shall include specific part numbers.
- B. Following project completion and testing, the EMS contractor will submit as-built documentation reflecting the exact installation of the system.

**1.11 WARRANTY**

- A. The EMS Contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the EMS Contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. EMS equipment shall be warranted for a period of 5 years from the time of system acceptance.

- B. Warranty of equipment is limited to replacement of defective products.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems,
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Project Manager at least 10 days prior to bid due date.

### **2.2 WIRELESS GATEWAY (WG)**

- A. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements
- B. The WG must provide the following hardware features as a minimum:
  - 1. Single Ethernet Port.
  - 2. One micro-USB 5VDC power input.
  - 3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.
- C. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).
- D. The WG shall be able to support 2000 Internet Programmable Thermostats.

### **2.3 INTERNET PROGRAMMABLE THERMOSTAT (IPT)**

- A. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.
- B. The IPT shall provide a keypad for setting:
  - 1. Temperature Set points.
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Light Button.

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- C. The IPT shall include a wiring terminal for controlling a single zone HVAC unit. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the HVAC unit it will be controlling. Over these 3-wires the thermostat must still be able to control the HVAC unit based on these specifications.
- D. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:
  - 1. Naming the thermostat
  - 2. Grouping multiple thermostats.
  - 3. Heat Pump or Conventional system setting.
  - 4. If Heat Pump; reversing valve O or B setting.
  - 5. Cycles Per Hour (1 - 6).
  - 6. Anticipation Degrees (0°F - 0.5°F)
  - 7. Calibration Degrees (2.0°F - -2.0°F)
  - 8. Heat Stages (0 - 2)
  - 9. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
  - 10. Cool Stages (0 - 2)
  - 11. Fan Stages (1 - 2)
  - 12. Fan Circulation Minutes Per Hour.
  - 13. Temperature Display (Fahrenheit or Celsius)
  - 14. Heat Range Temperature Setting Limitation
  - 15. Cool Range Temperature Setting Limitation
  - 16. Ability to disable and enable Keypad Control through schedule.
  - 17. Heat consumption (kw, btu, ton, or watt)
  - 18. Cool consumption (kw, btu, ton, or watt)
  - 19. Notification Sensitivity (High, Medium, Low)
  - 20. Alarm of exceeding temperature based on a Safe Range
  - 21. Schedule set times (2, 3, 4, or Variable).
- E. IPT settings and control through the Web Base App shall be in real-time and include:
  - 1. Space Temperature
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Current set point.
  - 5. Relay status (Heat/Cool and Fan).
  - 6. Historical Trend Graphs.
  - 7. Scheduling
  - 8. Lock and Unlock Entire Thermostat's Keypad
  - 9. Lock and Unlock the Thermostat's Fan Mode setting Only

## **2.4 WEB BASED GRAPHICAL USER INTERFACE**

- A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.
- B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.
- C. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.
- D. The Web Based client shall support at a minimum, the following functions:
  - 1. User log-on identification and password shall be required.
  - 2. HTML programming shall not be required to display any graphics or data on the Web page.
  - 3. Storage of data shall reside within the cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or an on-site server is not acceptable.
  - 4. Users shall have administrator and user definable access privileges.
  - 5. OpenAPI interface with XML data output.
- E. Schedules:
  - 1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
  - 2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
  - 3. The WBA shall provide the user the ability to:
    - a. View Schedules.
    - b. Add/Modify Schedules.
    - c. Assign Thermostat to a Group Schedule.
    - d. Delete Schedules.
- F. Trending
  - 1. The WBA shall provide real-time trend information on:
    - a. Each IPT's space temperature.
    - b. Each IPT's temperature set points.
    - c. Each IPT's current call; heat, cool, and/or fan.
    - d. Each IEE's call for economization
  - 2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
    - a. space temperature; with resolution of every 1/10th of a degree Fahrenheit.
    - b. IPT's temperature set points.
    - c. indication of whether the thermostat was calling for; heat, cool, and/or fan.

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3. Trend data shall be viewable on the WBS

**G. Alarm Notifications**

1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
  - a. space temperature and temperature change.
  - b. IPT's temperature set points.
  - c. IPT's current call; heat, cool, and/or fan.
2. The WBA shall be able to provide a user with the ability to:
  - a. View Alarms.
  - b. Set Alarm Notification sensitivity level to High, Medium, or Low.
  - c. Delete Alarms.
3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

**H. Consumption Usage**

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

**2.5 WIRED REMOTE TEMPERATURE SENSORS AND DIGITAL ALARM INPUT**

**A. Input Temperature Sensor (ITS).**

1. The ITS shall connect to the Internet Programmable Thermostat over 3-wires.
2. ITS shall provide at least one external 10K Type II thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past temperature data for ITS.
4. The trend data shall be viewable on the WBA.
5. ITS must be accurate to  $\pm 1.0^{\circ}\text{F}$
6. ITS must be able to be installed up to 500' away from IPT using standard thermostat wiring.



**2.6 INTERNET ENABLED ECONOMIZER (IEE)**

- A. The IEE shall connect to the Internet Programmable Thermostat (ITS) with ONLY 3-wires. No additional wiring must be required between the IEE and the ITS to gain complete Title 24 compliant economization control.
- B. IEE shall provide up to three 10K Type II external thermistor temperature sensor input.
- C. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:
  - 1. Calls for Economization
  - 2. Outside Air Damper Position
  - 3. Supply and Outside Air Temperature
- D. The trend data shall be viewable on the WBA.
- E. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.
- F. IEE must be able to be installed up to 500' away from IPT using standard thermostat wiring.
- G. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.
- H. IEE must have a settable 0-10VDC output for Variable Frequency Drive (VFD) control.
  - 1. IEE must be configurable for different VFD speeds based on calls for cold, heat, and ventilation.
- I. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.

**2.7 WIRELESS PROXIMITY SENSORS**

- A. Wireless Proximity Sensor (WPS).
  - 1. The WPS shall connect with the Internet Programmable Thermostat over the 802.15.4 wireless network.
  - 2. WPS shall be powered by 2 AA batteries or equivalent.
  - 3. WPS must be able to be used for either:
    - a. Accepting a motion sensor's 2-wire dry contact output.
      - 1) The WPS shall be able to notify an Internet Programmable Thermostat if a motion sensor's dry contact is in either the open or closed position.
      - 2) Dry contact open positions will indicate that the space is occupied and the IPT must be able to automatically setback its temperature setting by a range of 0F - 10F or OFF.
      - 3) Dry contact closed position will indicate that the space is unoccupied and set the temperature to a comfort setting when the space is occupied.

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- 4) Setback settings and comfort settings must be settable through the Internet Programmable Thermostat's schedule through the Web Based App (cannot be settable at thermostat).
  - 5) Web Based App must be able to display when a space is "Unoccupied".
- b. Detecting if a Window OR Door is Opened or Closed.
  - 1) The WPS must have a built-in magnetic sensor and come with a magnet that can be installed on a door OR window.
  - 2) The WPS must be able to notify an Internet Programmable Thermostat if the door is open and the IPT must automatically turn to the OFF position.
  - 3) The WPS must be able to notify an Internet Programmable Thermostat if the door is closed and the IPT must automatically return to its last temperature and system settings.
  - 4) Web Based App must be able to display when the Door OR Window is Open and must be able to be set to indicate "Door" or "Window".
4. Web Based App shall be able to notify if the WPS batteries are low and record and provide at least two years of past history on occupancy and/or door/window status for each space a WPS is installed in.
5. The trend data shall be viewable on the Web Based App.
6. Internet Programmable Thermostat must be able to connect with at least 8 WPS, each WPS must have a unique serial number and each WPS shall be settable, through the Web Based App, as either a motion sensor input or as a door/window sensor.

**PART 3 - EXECUTION**

**3.1 CONTRACTOR RESPONSIBILITIES**

**A. General**

1. Installation of the Energy Management System shall be performed by an approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.

**B. Demolition**

1. Remove controls which do not remain as part of the Energy Management System. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

**C. Access to Site**

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.

D. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

E. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

**3.2 WIRING, CONDUIT, AND CABLE**

- A. All control wires between HVAC units and thermostat locations to be furnished and installed by the Mechanical Contractor. The EMS Contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the EMS Contractor. The EMS Contractor shall provide wiring between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

**3.3 HARDWARE INSTALLATION**

A. Installation Practices for Devices

1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. Identification

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the EMS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

C. Existing Controls.

1. Existing controls are not to be reused. All EMS devices will be new.

D. Control System Switch-over

1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

E. Location

1. The location of sensors is per mechanical and architectural drawings.

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2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
3. If Input Temperature Sensor(s) (ITS) is used as Outdoor air sensor, outdoor air sensors will be mounted on the north building face directly in the outside air. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
4. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

**3.4 SYSTEM PROGRAMMING**

A. General.

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the Contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

**3.5 COMMISSIONING AND SYSTEM STARTUP**

A. EMS device functional testing.

1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.
2. Please contact Tom Hardy of RSD-Total Control for project quotation @ 916-600-3027.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Fans.
  - 2. Air inlets and outlets.
  - 3. Filters.
  - 4. Dampers.
  - 5. Ductwork.
  - 6. Insulation.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 23 0050, Basic HVAC Materials and Methods.
- C. Section 23 0593, Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 0900, Direct Digital Control (DDC) System for HVAC.

### **1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 0050, Basic HVAC Material and Methods for additional requirements.
  - 1. Upon approval of submittal, provide manufacturer's installation and operating instructions to the Project inspector for the following:
    - a. Fire dampers, smoke dampers, and combination smoke-fire dampers.
    - b. Type 1 kitchen exhaust field applied grease duct enclosures.
- C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

### **1.4 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.

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- B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.
- C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

**1.5 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Belts: One set(s) for each belt-driven unit.
  - 2. Provide one complete set(s) of filters for each filter bank.

**1.6 COORDINATED LAYOUT**

- A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.
- B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to design Drawings.
  - 1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
  - 2. Show on drawings the intended elevation of all ductwork in accordance with the following example:
    - a. B.O.D. = 9'-0"  
OFFSET UP 6"  
B.O.D. = 9'-6"
  - 3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.
- C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

- D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

## **1.7 QUALITY ASSURANCE**

### **A. Design Criteria:**

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

## **1.8 FIELD CONDITIONS**

- A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:
  1. Notify Architect no fewer than two days in advance of proposed interruption of services.
  2. Do not interrupt services without Architect's written permission.

## **1.9 WARRANTY**

- A. Air Cooled Condensing Unit: Unit shall have 5 year limited compressor warranty.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

## **PART 3 - AIR CONDITIONING SYSTEM PRODUCTS**

### **A. SPLIT SYSTEM HEAT PUMPS**

- B. General: Furnish and install split system air-to-air heat pump system, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

### **C. Quality Assurance:**

1. Unit shall be ETL or UL listed and labeled.

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2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
  3. Unit shall be rated in accordance with ARI standard 210.
- D. Delivery, Storage and Handling: Follow manufacturer's recommendations.
- E. Heating/Cooling System: The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.
- F. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.
1. Cabinet:
    - a. Wall mounted: Molded white high strength plastic.
      - 1) Provide wall mounted unit with factory mounting plate.
    - b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
    - c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.
  2. Fans: Double inlet, forward curved, statically and dynamically balanced.
  3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.
    - a. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 0050, Basic HVAC Materials and Methods.
  4. Air Outlet: With motorized horizontal and vertical vanes.
    - a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.
  5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.
  6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.
- G. Outdoor Section:
1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
  2. Condenser Fan Grille: ABS plastic.
  3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
  4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
  5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.
- H. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:
1. Pelican Controls.



2. Test and check functions.
  3. Diagnostic functions.
  4. Vane position control.
  5. Fan speed adjustment.
  6. Temperature adjustment.
  7. Automatic restart.
  8. Mode selection, including heat/auto/cool/dry/fan.
    - a. Provide lockable enclosure for wall mounted controller.
- I. Safeties: Shall include the following, as a minimum:
1. Five minute compressor anti-recycle timer.
  2. High pressure protection.
  3. Current and temperature sensing motor overload protection.
- J. Filters: Provide manufacturers washable filters for indoor unit. Provide sufficient filters for four complete changes for each unit.
- K. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.
- L. Refrigerant Piping:
1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
  2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
- M. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Lennox to match Lodi USD District Standards for Multi-Zone Applications.
- N. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.
- 3.2 AIR COOLED CONDENSING UNIT**
- A. Provide outdoor-mounted, factory assembled, single piece, air-cooled, split-system air conditioner unit suitable for ground or rooftop installation, rated in accordance with ARI Standard 210, and UL or ETL listed and labeled. Provide refrigerant charge R-410A, all internal wiring, piping, controls, compressor, and special features required prior to field start-up. Design unit to conform to the following:
1. ANSI/ASHRAE latest edition.
  2. NEC latest edition.
  3. Unit cabinet to be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hr salt spray test.

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4. Unit shall be constructed in accordance with UL standards.
- B. Unit shall be certified for capacity and efficiency, and listed in the latest ARI directory.
- C. Unit shall be manufactured in a facility registered to ISO 9001:2000.
- D. Unit shall be Energy Star Qualified.
- E. Provide unit with 5 year limited parts warranty.
- F. Cabinet:
  1. Unit cabinet constructed of galvanized steel, bonderized, and coated with powder coat paint.
- G. Fans:
  1. Direct-drive propeller type condenser fan, discharging air vertically.
  2. Totally enclosed condenser fan motors, 1-phase type with Class B insulation and permanently lubricated bearings, and corrosion resistant shafts.
  3. Condenser fan openings equipped with PVC-coated steel wire safety guards.
  4. Statically and dynamically balanced fan blades.
- H. Compressor:
  1. Hermetically sealed compressor mounted on rubber vibration isolators.
  2. Compressor with sound insulator.
- I. Refrigeration Components:
  1. Refrigerant circuit to include liquid and vapor line shut-off valves with sweat connections.
  2. System charge of R-410A refrigerant and compressor oil.
  3. Unit to be equipped with factory-supplied high-pressure switch, low pressure switch, and filter drier.
  4. Provide unit with manufacturer's refrigerant line set.
  5. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
- J. Condenser Coil:
  1. Air-cooled condenser coil constructed of aluminum fins mechanically bonded to copper tubes.
  2. Coils shall be leak and pressure tested.
- K. Electrical Requirements:
  1. Unit shall have single point power connection.
  2. Provide unit with 24V control circuit.

- L. Operating Characteristics:
  - 1. Unit shall be capable of starting and running a 115 degrees F ambient outdoor temperature per maximum load criteria of ARI Standard 210.
  - 2. Compressor with standard controls shall be capable of operation down to 55 degrees F ambient outdoor temperature.
- M. Provide the following additional components and features:
  - 1. Provide evaporator freeze thermostat, winter start control, compressor start assist capacitor and relay, low ambient controller, and ball bearing fan motor.
  - 2. Provide expanded metal coil guard for all sides of the air cooled condensing unit. Coil guard shall be as manufactured by MicroMetl, Can-Fab, or equal.
- N. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Carrier Corporation.
  - 2. Trane Inc.
- O. Owner Training: Manufacturer shall provide one on-site 1-hour training sessions for Owners' maintenance personnel.

### **3.3 COOLING COIL**

- A. Provide direct expansion encased cooling coil.
  - 1. Install encased coil to operate properly in vertical or horizontal position as required. Construct coil with aluminum plate fins mechanically bonded in non-ferrous tubing with all joints brazed ultrasonically. Coil shall have factory-installed refrigerant metering device, refrigerant line fittings which permit mechanical connections, and condensate pan with primary and auxiliary drain connections.
  - 2. Construct casings of galvaneal steel, bonderize, insulate, and finish with baked enamel.

### **3.4 REFRIGERATION PIPE AND FITTINGS**

- A. Refrigeration gas and liquid piping shall be type ACR hard drawn copper tubing, cleaned and capped in accordance with ASTM B280, with wrought copper fittings. All joints shall be brazed with Sil-fos under nitrogen purge. Relief valve discharge piping shall be full size of relief discharge port.
  - 1. Manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping may be utilized at Contractor's discretion.
    - a. Heat Pump Systems: Use of manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping between outdoor condensing units and indoor heat recovery controllers, or distribution headers and tees is not allowed. When system manufacturer's installation instructions allow use of refrigerant line-set piping between indoor heat recovery controllers, or distribution headers and tees, and air terminal devices, follow instructions for allowable pipe size range and support to avoid forming traps in the piping.

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- B. Refrigeration Piping Specialties: Furnish and install Superior, Sporlan, Alco, Henry, or equal, stop valves, solenoid valves, adjustable thermal expansion valves, sight glass, flexible connection, charging valve, and drier with valve bypass in the liquid lines and Superior DFN shell and cartridge suction line filter sized 2-1/2 times tonnage.

- 1. Install only those refrigeration piping specialties recommended by manufacturer of specific installed equipment.

**3.5 REFRIGERANT ACCESS VALVE LOCKING CAPS**

- A. Each refrigerant circuit access valve located outside buildings, including valves located on roofs, shall be provided with a locking cap. Caps shall be of metal construction, with threaded brass inserts. Caps shall be color-coded according to ASHRAE standards for R22 and R410A refrigerant gasses, universal color for other refrigerant gasses. Caps shall be removable only with cap manufacturer's handheld tool.

- 1. Provide minimum of two (2) cap removal tools for every ten (10) air conditioning units or other systems containing refrigerant installed under this Project.

**3.6 AIR INLETS AND OUTLETS**

- A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Ceiling, wall or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.
- C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

**3.7 AIR FILTERS**

- A. Provide MERV 13 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:
  - 1. Standards:
    - a. ASHRAE Standard 52.2-2007.
    - b. Underwriters Laboratories: U.L. 900, Class 2.
  - 2. Construction:
    - a. Media: Synthetic or cotton-synthetic blend with radial pleats.
    - b. Media Frame: High wet-strength beverage board.
    - c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.
  - 3. Performance: 2" deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Camfil Farr, Inc., model 30/30.
  - 2. Flanders Corporation, model 40 LPD.
- C. Temporary (Construction Period) Filters:
  - 1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer's directions, in order to provide protection for the unit prior to occupancy by the Owner.
  - 2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.
- D. Spare Filters:
  - 1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

### **3.8 DAMPERS**

- A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.
- B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.
  - 1. Rectangular Ductwork:
    - a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
    - b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
    - c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.
  - 2. Round Ductwork:
    - a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
    - b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches

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damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.

3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

**C. Fire Dampers and Combination Fire/Smoke Dampers:**

1. Fire dampers and combination fire/smoke dampers shall be listed and approved by the California State Fire Marshal. Installation shall conform to the manufacturer's UL approved installation instructions.
  - a. Fire dampers shall be UL 555 classified and labeled as dynamic fire dampers approved for wall and floor installation. They shall ship from the manufacturer as an assembly with a minimum 20-gauge factory installed sleeve. Sleeve length shall suit the requirements of the wall construction. Each dynamic fire damper/sleeve assembly shall ship complete with factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dynamic fire dampers for vertical installation must consist of a single section on sizes up to 33" x 36" and a single section on sizes up to 24" x 24" for horizontal installation. 1-1/2 hour dynamic fire dampers shall be Ruskin DIBD20, Pottorff, or equal. 3 hour dynamic fire dampers shall be Ruskin DIBD230, Pottorff, or equal.
  - b. Fire dampers for high pressure/velocity systems where velocities exceed 2000 fpm and/or 4" w.g. pressure fire damper shall be Ruskin FD60, Pottorff, or equal
  - c. Fire dampers for ceiling installation shall be UL 555C classified and labeled as ceiling dampers. They shall be provided with a thermal insulating blanket to fit the inlet or outlet condition if required by the application. Ceiling dampers shall be Ruskin CFD 2, 3, 4 or 5. Ceiling dampers for ceilings constructed of wood shall have UL tested in design L501 and shall be Ruskin CFD7, Pottorff, or equal.
  - d. Combination fire/smoke dampers. Dampers shall be UL classified and labeled as Leakage Class I Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall be warranted to be free from defects in material and workmanship for a period of 5 years after date of shipment. Damper/actuator assembly shall be tested to full open and full close at minimum 2000 fpm 250° F heated air and 4" w.g. with airflow in both directions. (Specified select: 250° / 350°, 2000 fpm/3000 fpm). Each damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage resulting from instantaneous damper closure. Release device shall be EFL type and shall allow reset from outside the sleeve after moderate temperature exposure. (Replacement type fusible links not acceptable.)
  - e. Two position combination fire smoke dampers shall be equipped with one or more factory installed, direct coupled, 120 volt, single phase, electric actuator for energize open – fail close operation. Dampers with multiple actuators shall be factory wired with single point connection at the EFL heat release device for connection to poser. Damper actuator shall include

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minimum one-year energized hold open (no cycles) and spring return (fail) close reliability. Damper/actuator shall include minimum 20,000 full open-full close cycle performances.

- f. Modulating combination fire smoke dampers shall be equipped with one or more factory installed contact for modulating signal connection. Damper/actuator shall include minimum 100,000 full open-full close cycle performances with spring return (fail) close on loss of power.
- g. Round combination fire smoke dampers up to 24" diameter shall be true round type with minimum 20 gauge galvanized steel designed for lowest pressure drop and noise performance. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17 inches minimum length and factory "roll formed" one-piece angles with pre-punched holes. Dampers shall be Ruskin FSDR25, Pottorff, or equal.
- h. Round (larger than 24" diameter) or rectangular combination fire smoke dampers shall include roll-formed structural hat channel frame, reinforced at the corners, formed from a single piece of minimum 16 gauge equivalent thickness formed from single piece galvanized steel. Bearings shall be stainless steel turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17" minimum length and factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dampers shall be Ruskin FSD60, Pottorff, or equal.
- i. 3-hour rated combination fire smoke dampers shall be Ruskin model FSD60-3, Pottorff, or equal.
- j. All FSD60 type dampers shall be AMCA licensed and shall bear the AMCA Seal for Air Performance. AMCA certified testing shall verify pressure drop does not exceed .03" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper.
- k. Wall type fire/smoke damper:
  - 1) Combination fire/smoke dampers for use in the wall of exit corridors shall be classified and labeled as Leakage Class II Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall meet the requirements for combination fire/smoke dampers in paragraph 3 above except AMCA certified testing shall verify pressure drop does not exceed .07" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper and blades shall be single skin galvanized steel 10 gauge minimum with 3 longitudinal grooves for reinforcement. Dampers shall be Ruskin FSD36, Pottorff, or equal.
  - 2) Front access combination fire/smoke dampers shall meet all the requirements for combination fire/smoke dampers in paragraph 3 above except pressure drop requirement. In addition the dampers shall be constructed so that actuators and all accessories are accessible from the grille side. Actuators and accessories shall be housed within an integral cabinet on the side of the damper frame and

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shall not be installed in the air stream in front of the damper. The damper sleeve shall be minimum 14" and flanged to accept a steel framed grille. The sleeve shall be covered with fire resistant material. Dampers shall be Ruskin FSD60FA, Pottorff, or equal.

- I. Ceiling type fire/smoke damper for tunnel type corridor construction: Combination fire/smoke dampers for use in the corridor ceiling of tunnel type corridor construction shall be UL classified and labeled as Corridor Damper. Dampers shall meet the requirements of paragraph 4a above except pressure drop testing does not require AMCA certification. Dampers shall be Ruskin FSD36C, Pottorff, or equal.
  - m. Fusible links shall have temperature rating approximately 50° F above normal maximum operating temperature of the heat producing appliance.
    - 1) If project requires re-openable fire/smoke dampers, provide Ruskin 165 ° F / 350° F TS150, NCA or equal. The TS150 firestat replaces the EFL and allows the damper to be re-opened from remote location up to 350 ° F. TS150 shall include full open and full closed damper position contacts for interface with remote position indication panel.
    - 2) Each fire/smoke damper shall be equipped with “controlled closure” quick detect heat actuated release device to prevent duct and HVAC component damage. Release device shall allow easy reset after moderate temperature rise outside the sleeve. Heat release device shall be the Ruskin EFL, NCA or equal.
    - 3) Unless the system is using a validation control system, each fire/smoke damper shall be equipped with a control panel including blade position indicator lights and a key operated switch. The panel cover shall be oversized for flush mount into the wall or ceiling and shall have a brushed look. Control panel shall be Ruskin MCP2, Pottorff, or equal.
  - 2. All actuators used for smoke dampers or combination fire/smoke dampers shall have a cycle time requirement of not more than every twelve months and shall be rated for continuous "On" duty and shall be provided with internal spring return. Actuators shall be equipped with pilot light, remote key test switch, end switch and circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper. Electric motors shall be Invensys MA-250, MA-253, Honeywell H2000, or equal.
- D. Where required to suit the size of damper required, provide manufacturers standard UL Classified mullions, arranged to support multiple dampers. Assembly shall be of minimum 16 gauge galvanized steel, complete with all accessory caps and framing members required for installation.

### 3.9 DUCTWORK

- A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.
1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and



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install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.

2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.
3. Gauges, joints and bracing shall be in accordance with the California Mechanical Code.
4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.
  - a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
  - b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

**B. Design and installation standards:**

1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.
2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
3. California Mechanical Code.

**C. Duct sizes indicated are external sizes.**

**D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.**

1. Provide mill certification for galvanized material at request of the Project Inspector.

**E. Duct Sealants:**

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.

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- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1) Design Polymerics, model DP1010.
  - 2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
  - 3) McGill Airseal, LLC.
- F. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
- G. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.
- H. Rectangular Duct Fabrication:
  - 1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
    - a. SMACNA HVAC Duct Construction Standards
    - b. California Mechanical Code
  - 2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

<u>Table A</u>		
<u>Duct Dimension</u>	<u>Minimum Gauge</u>	<u>Joint Reinforcement Per CMC</u>
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4

- 3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
- 4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph "DAMPERS" for damper requirements.
- 5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

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6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

I. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.
2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.
3. Duct Access Panels:
  - a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:
    - 1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
    - 2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

J. Flexible Connectors:

1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - a. Minimum Weight: 26 oz./sq. yd.
  - b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
  - c. Service Temperature: Minus 50 to plus 200 deg F.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Ductmate Industries, Inc., model Proflex.
  - b. Ventfabrics, Inc., model Ventlon.

**3.10 PIPE JOINING MATERIALS**

- A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.

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**B. Brazing Filler Metals:**

1. General Duty: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
2. Refrigerant Piping:
  - a. Joining copper to copper: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
  - b. Joining copper to bronze or steel: AWS A5.8, Bag-1, silver alloy unless otherwise indicated.

**3.11 INSULATION MATERIALS**

**A. General:**

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

**B. Insulation Materials:**

1. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) Aeroflex USA, Inc.
    - 2) Armacell LLC.
    - 3) K-Flex USA.
2. Mineral-Fiber, Preformed Pipe Insulation:
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) Johns Manville; a Berkshire Hathaway company.
    - 2) Knauf Insulation.
    - 3) Manson Insulation Inc.
    - 4) Owens Corning.

- b. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.
- 3. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) CertainTeed Corporation.
    - 2) Johns Manville.
    - 3) Knauf Insulation.
    - 4) Owens Corning.

**3.12 FIELD APPLIED JACKETS:**

- A. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 2. Johns Manville, model Zeston, with Zeston 2000 fitting covers.
  - 3. Proto Corporation, model LoSmoke.
- B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. ITW Insulation Systems; Illinois Tool Works, Inc.
    - c. RPR Products, Inc.
  - 2. Finish and thickness are indicated in field-applied jacket schedules.
  - 3. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
  - 4. Factory-Fabricated Fitting Covers:
    - a. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - b. Tee covers.
    - c. Flange and union covers.
    - d. End caps.
    - e. Beveled collars.
    - f. Valve covers.

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- g. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

**3.13 TEMPERATURE CONTROL SYSTEM**

- A. Refer to Section 23 0900, Pelican Control System for HVAC to match District Standards.

**PART 4 - EXECUTION**

**4.1 ROOF MOUNTED EQUIPMENT INSTALLATION**

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.
- B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.
- C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.
- D. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.
- E. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2 inch thick, 3 pound density fiberglass insulation board.
- F. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors. Provide G 90 galvanized steel weather hood over flexible connections exposed to the weather. Weather hood minimum gauge shall be per PART 2 article, Ductwork, Table A.
- G. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

**4.2 SPLIT SYSTEM AC, AND HEAT PUMP SYSTEMS INSTALLATION**

- A. General:
  - 1. Install units level and plumb.
  - 2. Install evaporator-fan components as detailed on Drawings.
  - 3. Install ground or roof- mounted condensing units as detailed on Drawings.
  - 4. Install seismic restraints as required by applicable codes. Refer to Article, Submittals, in Section 23 0050, Basic HVAC Materials and Methods, for delegated design requirements for seismic restraints.
  - 5. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
  - 6. Install cooling coil condensate primary drain pan piping, and overflow, if provided, and run to nearest code-compliant receptacle, or as indicated on Drawings. Install

secondary drain pan for units installed over permanent and suspended-tile ceilings. Install secondary drain pan piping and terminate 1/2 inch below ceiling, with escutcheon, in a readily visible location or as shown on Drawings.

7. Install air filters at each indoor unit. Install washable, permanent filters at indoor units designed to accept washable, permanent filters. Refer to Drawings schedule, and Article, Air Filters, in this Section, for filter requirements for ducted, above-ceiling units incorporating mixing boxes.
8. Duct Connections: Duct installation requirements are specified in Article, Ductwork, in this Section. Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Article, Ductwork, in this Section.

#### **4.3 REFRIGERANT PIPING INSTALLATION**

**A. General:**

1. Install refrigerant piping according to ASHRAE 15. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
2. Install piping straight and free of kinks, restrictions or traps.
3. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
4. Slope horizontal suction piping 1 inch/10 feet towards compressor.
5. Install fittings for changes in direction and branch connections.
6. Piping under raised floors shall be kept 6 inches minimum above ground; excavate as necessary.
7. Install locking caps on refrigerant access valves located outside building, including valves located on roofs.
8. Insulate refrigerant piping, including liquid and hot gas pipes when required by system manufacturer, and including headers, branches, and other components as detailed in unit manufacturers' literature.

**B. Factory Pre-charged and sealed line set piping:**

1. Keep the entire system clean and dry during installation.
2. All tubing shall be evacuated and sealed at the factory. The seal must not be broken until ready for assembly.
3. If there is any evidence of dust, moisture, or corrosion, the tubing must be cleaned out by drawing a swab soaked with methyl alcohol through the tubing as many times as necessary to thoroughly clean the tubing.
4. Where line set piping is used, enclose in iron or steel piping and fittings or in EMT conduit.

**C. Field Assembled Refrigerant Piping:**

1. Select system components with pressure rating equal to or greater than system operating pressure.

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2. Where subject to mechanical injury, enclose refrigerant piping in EMT conduit.
3. Where field assembled refrigerant piping is exposed mounted at grade, on walls, and on roof, enclose in 16 gage galvanized steel enclosure.
4. When brazing, remove solenoid valve coils and sight glasses, also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

**4.4 FAN INSTALLATION**

- A. Ceiling Mounted Fans: Mount variable speed switch within fan housing. Mark final balance point on variable speed switch.
- B. Provide access doors for fans or motors mounted in ductwork.
- C. Mount all fans as detailed on Drawings and in compliance with CBC standards.
- D. Fan motors mounted in air-stream to be totally enclosed.
- E. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.
- F. Roof fans shall be mounted level.
- G. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

**4.5 AIR INLETS AND OUTLETS INSTALLATION**

- A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
- B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.
- C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.
  1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
  2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.



- 3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.
- D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.
- E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

#### **4.6 FILTER HOUSING INSTALLATION**

- A. Mount filters in airtight galvanized steel housings furnished by the filter manufacturer, or shop-fabricated. Housings shall incorporate integral tracks to accommodate filters, and flanges for connection to duct or casing system.
  - 1. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.
  - 2. Access Doors: Hinged, with continuous gaskets on perimeter and positive-locking latch handle devices.
- B. Air filters shall be accessible for cleaning or replacement.
- C. Identify each filter access door with 1/2 inch high minimum stenciled letters.

#### **4.7 TEMPORARY FILTERS**

- A. Provide temporary filters for fans that are operated during construction; after construction dirt has been removed from the building install new filters at no additional cost to the Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.
  - 1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

#### **4.8 DAMPER INSTALLATION**

- A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.
- B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.
- C. Install fusible link fire dampers full size of duct at points where shown or required.
- D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.

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1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

**4.9 DUCTWORK INSTALLATION**

- A. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.
- B. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealer shall be fire retardant. Sheet metal screw for joints shall be minimum #10 size galvanized.
- C. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw

- D. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger

- E. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.
- F. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.

1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

#### **4.10 PIPE JOINTS AND CONNECTIONS**

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Copper Pipe and Tubing: All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except pneumatic control piping, and hydronic piping having grooved-end fittings and couplings.

C. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
3. Anchor piping securely on the system side of each flexible connection.

#### **4.11 INSULATION AND FIELD-APPLIED JACKET INSTALLATION**

A. General:

1. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
2. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
3. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
4. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, ductwork, and equipment.
5. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.

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6. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
7. Install insulation with longitudinal seams at top and bottom of horizontal runs.
8. Install multiple layers of insulation with longitudinal and end seams staggered.
9. Keep insulation materials dry during application and finishing.
10. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
11. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
12. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
13. For piping, ductwork, and equipment, with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
14. Repair all damage to existing pipe, duct and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.
15. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - a. Install insulation continuously through hangers and around anchor attachments.
  - b. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - c. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - d. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

**B. Piping Insulation Installation:**

1. General:
  - a. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - b. Provide removable insulation covers for items requiring periodic service or inspection.
  - c. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation.
  - d. Provide pre-formed PVC valve and fitting covers for indoor piping.

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- e. Provide factory-fabricated aluminum valve and fitting covers for outdoor piping.
    - f. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
  - 2. Below-Ambient Services Including Chilled Water Supply and Return and Refrigerant Piping:
    - a. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of woven glass fiber cloth saturated in Foster Sealfas 30-36, 3M, or equal, extending 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC or aluminum fitting covers.
    - b. Variable refrigerant flow (VRF) heat pump systems: Insulation for VRF system refrigerant piping shall be installed according to VRF unit manufacturer's instructions.
  - 3. PVC Jacket Installation:
    - a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
      - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
  - 4. Aluminum Jacket Installation:
    - a. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
- C. Duct Insulation Installation:
- 1. General:
    - a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
    - b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.

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- c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.
  - 2. Mineral Fiber Blanket Installation:
    - a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.
  - 3. PVC Jacket Installation:
    - a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
      - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Equipment Insulation Installation:
- 1. General:
    - a. Insulate pumps, coil u-bends where exposed outside airstream, air separators, heating hot water and chilled water storage tanks, and other elements that are in series with the fluid flow, according to the requirements of the California Energy Code.
  - 2. Mineral-Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.
    - a. Apply adhesives according to manufacturer's recommended coverage rates per unit area, and for percent coverage of tank and vessel surfaces.
    - b. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
    - c. Protect exposed corners with secured corner angles.
    - d. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
      - 1) Do not weld anchor pins to ASME-labeled pressure vessels.
      - 2) Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
      - 3) On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
      - 4) Do not overcompress insulation during installation.
      - 5) Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.

- 6) Impale insulation over anchor pins and attach speed washers.
- 7) Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- e. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
- f. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
- g. Stagger joints between insulation layers at least 3 inches.
- h. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
- i. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- j. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
3. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
  - a. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
  - b. Seal longitudinal seams and end joints.

#### **4.12 DUCTWORK SEALING AND LEAK TESTING**

- A. All ductwork shall receive a Class A seal.
- B. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in conditioned space.
- C. Leakage Classes:

<u>Pressure Class</u>	<u>Leakage Class</u>	
	<u>Round Duct</u>	<u>Rectangular Duct</u>
2"W.G. or less	8	16
4"W.G. or greater	2	4

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- D. All duct systems (supply, return, outside air intake, and exhaust), except those identified on compliance forms on Drawings as requiring Acceptance Testing per the requirements of the California Energy Code, shall be tested in accordance with the requirements of SMACNA "HVAC Air Duct Leakage Test Manual." Test pressure shall be equal to the pressure class of the duct. For additional duct leak testing requirements, refer to Section 23 0800.13, "Title 24 Commissioning of HVAC."

**4.13 TEMPERATURE CONTROL SYSTEM INSTALLATION**

- A. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type. System shall be Pelican to match District Standards.

**4.14 EQUIPMENT START-UP**

- A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.
- B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.
- C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of controls contractor, start-up technician, and test and balance contractor; all to work in concert to assure that the systems are started, balanced, and operate in accordance with the design.
- D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.
- E. For additional requirements, refer to article, Check, Test and Start Requirements, in Section 23 0050, Basic HVAC Materials and Methods.

**4.15 TESTING AND BALANCING**

- A. For testing and balancing requirements, refer to Section 23 0593, Testing and Balancing for HVAC.

**4.16 CLEANING AND PROTECTION**

- A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.
- B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.
- C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.



- D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

#### **4.17 EQUIPMENT MOUNTING**

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

#### **4.18 INDOOR PIPING INSULATION SCHEDULE**

- A. Refrigerant Piping:
  - 1. All pipe sizes: Insulation shall be one of the following:
    - a. Suction piping smaller than 1-1/2 inches diameter:
      - 1) Flexible Elastomeric: 1/2 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1/2 inch thick.
    - b. Suction piping 1-1/2 inches diameter and larger:
      - 1) Flexible Elastomeric: 1 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1 inch thick.
    - c. Suction piping for heat pump applications smaller than 1 inch diameter:
      - 1) Flexible Elastomeric: 1 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1 inch thick.
    - d. Suction piping for heat pump applications 1 inch and larger:
      - 1) Flexible Elastomeric: 1-1/2 inches thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1-1/2 inches thick.
  - 2. When equipment manufacturers' instructions indicate that refrigerant liquid and hot-gas gas piping be insulated, insulation thickness shall be equal to, and applied as described herein for refrigerant suction piping.

#### **4.19 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

- A. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1-1/2 inches thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.
  - 2. When equipment manufacturers' instructions indicate that refrigerant liquid piping be insulated, insulation thickness shall be equal to, and applied as described herein for refrigerant suction piping.

#### **4.20 INDOOR FIELD-APPLIED PIPING JACKET SCHEDULE**

- A. Piping, concealed: None.
- B. Piping, exposed: PVC, 20 mils thick.

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**4.21 OUTDOOR FIELD-APPLIED PIPING JACKET SCHEDULE**

- A. All Piping: Aluminum, Stucco Embossed: Thickness as follows:

<u>Outer Insulation Diameter (Inches)</u>	<u>Minimum Aluminum Jacket Thickness (Inch)</u>	
	<u>Rigid Insulation</u>	<u>Non-Rigid Insulation (Note 1)</u>
8 and Smaller	0.024	0.024

1. Note 1: Non-rigid Insulation is defined as having a compressive strength of less than 15 psi.

**4.22 INDOOR DUCT INSULATION SCHEDULE**

- A. Minimum R-Value = R-4.2.
- B. Supply and Return Ducts: Mineral Fiber Blanket, 1-1/2 inches thick, 0.75 lb/cu. ft.

**4.23 OUTDOOR DUCT INSULATION SCHEDULE.**

- A. Refer to article, Ductwork, for double-wall ductwork with interstitial insulation.

**4.24 INDOOR FIELD-APPLIED DUCT JACKET SCHEDULE**

- A. Insulated ducts in concealed spaces: None.
- B. Insulated ducts in exposed unconditioned spaces: PVC, 20 mils thick.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 CONDITIONS OF THE CONTRACT**

- A. The Conditions of this Contract (General, Supplementary, and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of this Section.
- B. Division-15 Mechanical sections apply to work of this section.

### **1.2 WORK INCLUDED**

- A. Types of Multizone Units required for project include the following: Modular-Split System - Penthouse
- B. MANUFACTURER: Subject to compliance with requirements, provide multizone units of the following manufacturer or Owner pre-approved equal, prior to bid:
  - 1. Custom Mechanical Equipment, Inc.
- C. Refer to drawings in this bid set for units to be provided.

### **1.3 QUALITY ASSURANCE**

- A. FLAME-SMOKE RATINGS: Except as otherwise indicated, provide thermal insulation with flame- spread index of 25 or less, fuel-contributed index of 50 or less, and smoke-developed index of 50 or less.
- B. AMCA STANDARDS: Comply with Air Movement and Control Association (AMCA) Standards as applicable to testing and rating fans.
- C. SMACNA COMPLIANCE: Comply with Sheet metal and Air-Conditioning Contractors National Association (SMACNA) ductwork construction standards as applicable to multizone units.
- D. ETL, AGA, & UL COMPLIANCE: Provide electric components for multizone units which have been listed and labeled by Underwriters Laboratories or by a testing organization of equal standing.
- E. ENERGY STAR LABEL: Provide written confirmation of listing of all furnaces in the "Directory of Certified Gas Fan-Type Central Furnaces", and furnaces must have the Energy Star® label.

### **1.4 SUBMITTALS**

- A. PRODUCT DATA: Submit manufacturer's specifications for multizone units showing dimensions, weight, capacities, ratings, certified fan performance with operating point clearly indicated, motor electrical characteristics, gauges and finishes of materials, and installation instructions.

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- B. **MAINTENANCE DATA:** Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals only.

**PART 2 - MATERIALS**

**2.1 SPLIT SYSTEM HVAC UNITS**

- A. **GENERAL:** Furnish and install multizone systems, complete with Open Protocol Direct Digital Controls, by Alerton or Owner pre-approved equal. The units shall be a standard product of a firm regularly engaged in the manufacture of heating/cooling equipment. The equipment shall be shipped completely factory tested and internally ready for field connections. Provide thermal overload protected motors.
1. All wiring shall be in compliance with NEC.
- B. **HEATING/COOLING SYSTEM:** The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.
- C. **SPECIFIED EQUIPMENT:** Approved equipment must include multiple independent heating, cooling, fan and economizer sections to provide system redundancy, improve reliability, increase system efficiency, and reduce energy usage. Equipment that requires reheat will not be acceptable. Any manufacturer not meeting these specifications must provide a detailed explanation of the deviation(s) from the specifications and all performance information necessary for the owner to complete a comparative life cycle cost analysis. The Owner reserves the right to reject any bids not meeting all specifications.
- D. **TECHNICAL SPECIFICATIONS:** The gas fired multizone units shall be factory assembled one- piece penthouse design and be listed by ETL as an approved HVAC appliance. The following components shall be factory installed, wired and plumbed inside the penthouse:
1. High efficiency two-stage, heating section (minimum 95% AFUE)
  2. Evaporator coils
  3. Fully modulating economizer dampers
  4. Low voltage control center
  5. Line and low voltage wiring in the penthouse
  6. Gas lines with single point exterior connection
  7. Condensate piping to single point interior connection
  8. Refrigerant piping to exterior of penthouse
  9. Combustion intake and exhaust piping to termination point
  10. Supply air zone head matching existing ductwork
  11. Interior lights and ground fault convenience outlet
  12. 30% efficient 2" MERV13 pleated filters
  13. Barometric pressure relief dampers

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14. Condenser rails for mounting condensers
  15. Main exterior electrical disconnect switch
  16. Step-down transformers
  17. Phase Protection
  18. Open protocol DDC Controller – BacNet Web Ready
- E. **STRUCTURE AND INSTALLED COMPONENTS:** Penthouse shall be constructed of coated, high ribbed galvanized steel siding and trim (25 year performance warranty) with R-9 insulation. Standard color is burnished slate. All louvers shall be coated to match the penthouse with integral bird screen. Unit base shall be designed to set on existing roof curbs and use existing ducts without the need for any transition curb or ducts. Lifting lugs shall be provided for rigging.
- F. **SERVICE ACCESS:** All components, wiring, and inspection areas shall be completely accessible through removable panels or doors.
- G. **HEATING:** Heating shall be high efficiency two stage condensing type, utilizing outside air for combustion. Units shall be certified with AGA laboratories and the ratings certified by GAMA, tested according to DOE test procedures and FTC labeling regulations. Unit shall be available for use with LPG/propane as an option. The units shall be Lennox EL296UH090XV60C with A.F.U.E. of 96.0%.
- H. **SUPPLY AIR FAN:** An independent, 1 Hp fan section is required for each heating section. Each blower assembly shall be statically and dynamically balanced. Maximum speed is 1100 RPM. Blower speed shall be reduced a minimum of one third of the design rotational speed to lower energy costs and reduce drafts when space conditions allow. Fan speed must be adjustable through digital blower balancing control within the user interface or the BAS. Change in blower speed must be gradual utilizing a VSM (DC) motor or Variable Frequency Direct Drive. Control sequence and equipment must be pre-approved by the Owner. Belt-driven fans shall not be acceptable. The entire assembly shall be resiliently rubber mounted.
- I. **COOLING:**
1. An independent, direct expansion single-stage cooling system shall be provided for each heating section. Evaporator coils shall be made with seamless copper tubing, aluminum fins mechanically bonded to durable copper tubes, and galvanized steel frame. Balanced port, adjustable thermal expansion valves shall be factory-installed. Refrigerant shall be R-410a. Each coil shall be thoroughly tested under high pressure and charged with nitrogen prior to shipment to further assure leak-proof construction.
  2. An independent air-cooled condensing unit shall be provided for each cooling coil. Units shall be set directly on the roof or on the existing roof curb using devices provided by the manufacturer.
  3. Condenser fan shall be TEFC, permanently lubricated direct drive motor with vertical discharge, rain shield and louvered steel top fan guard. All refrigerant piping shall be type "L" hard drawn refrigerant grade copper tubing. Backseating brass service valves shall provide access to refrigerant system. Field installed piping shall be as required by the manufacturer.

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4. Condenser coil is to be factory tested to insure leak-proof construction. Entire coil shall be accessible for cleaning. Refrigerant compressor shall be a Copeland Compliant Scroll. Unit shall be rated for a minimum 11.3 EER at ARI conditions with the evaporator coil and condenser section provided. The compressor shall be resiliently mounted, have built-in crankshaft lubrication, crankcase heater, discharge temperature limited, and current-and temperature- sensing motor overloads.
  5. The system shall be protected by high and low pressure switches and a five-minute compressor timed off cycle controller (anti-recycle timer).
  6. Unit Casings: Design for outdoor installation and provide weather protection for components and controls and have a PVC coated steel wire coil guard.
- J. ECONOMIZERS: An independent economizer section shall be provided for each heating section. Units shall be fully modulating with enthalpy or dry-bulb changeover and a manually adjustable minimum damper position. Outdoor air intake damper leakage shall not exceed three cfm/sq. ft. at 3" static pressure differential across the damper.
- K. FILTERS: Sufficient surface area on 2" pleated, 30% efficient filters shall be provided (Farr 30/30 or equivalent). All air shall pass through these filters prior to entering any fan, coil or heat exchanger.
- L. UNIT CONTROL – DDC CONTROLLER SPECIFICATION:
1. The controller used shall be 32-bit microprocessor based and graphically programmable to control each unit with 148 input/output (I/O) points:
    - a. Up to 76 universal inputs (individually jumper-selectable to select either a dry contact, thermistor, 0-20 mA, 0-5 VDC, 0-10 VDC, or RTD...with 12-bit resolution on all analog inputs)
    - b. Up to 40 digital outputs (relayed outputs with individual LED indication and individual HOA switches)
    - c. Up to 40 analog outputs (0-10 VDC or 0-20 mA)
  2. Capacity requirements greater than 148 I/O's can be added as an option. The maximum number of inputs and outputs the controller can accept is 180 (92 universal inputs, 48 digital outputs and 48 analog outputs).
  3. The controller must be capable of sensing CO2 levels by zone and modulating the fresh air by zone to established levels if required.
  4. There shall be no limits on the number of control loops that the controller can handle nor any programming limitations imposed. The controller shall have an on-board, jumper-selectable EIA-232 or EIA-485 open protocol port that supports the following communication protocols: BACnet (modes supported: MS/TP, PTP, and ARCnet), Modbus (modes supported: RTU and ASCII), N2 Bus, and LonWorks. If a controller does not support all of these protocols, then the equipment manufacturer shall include and provide in their price all of the necessary additional communication gateway(s) to support all of these protocols.
  5. All programming memory shall be stored in 16 MB non-volatile battery-backed RAM (with 12 MB available for use), 8 MB Flash Memory and 32-bit memory bus, thus requiring no battery-backup and providing for rugged electrical noise immunity. The controller shall contain an on-board battery- backed (up to 10

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years) hardware clock for stand-alone scheduling capability and accurate recording of date/time on alarm events and data logging. The time/date maintained by the hardware clock shall automatically adjust for daylight savings time and leap years.

6. As simple-to-use keypad/display (KPD) unit with a minimum 4 line by 40 characters per line backlit LCD with 22 function buttons will be supplied with each unit. Software and hardware features of the KPD shall include:
  - a. Custom definable displays and menus.
  - b. Alarm indicator light and horn as well as an acknowledge (or "mute") button. The alarm light shall be active anytime there is an active alarm, and the alarm horn shall be active anytime there is an active, unacknowledged alarm. It shall be software selectable which individual alarm conditions, if any, that activate the horn.
  - c. Alarm history buffer displaying the 64 most recent alarms, including custom alarm text and time stamping of time of alarm occurrence and time when the alarm condition returned-to-normal.
  - d. User password protection for KPD editing access as well as separate technician password protection.
  - e. View and adjustment of operating schedules – normal, holiday, and override schedule modes.
  - f. Ability to connect or disconnect the KPD "on-the-fly" without the need to cycle power to the controller for the KPD to be fully functional.
  - g. Option to mount the KPD component itself up to 1,500 feet away from the unit.
  - h. Ability to reset the controller's time/date.
  - i. Ability to field-adjust through the KPD which protocol the controller communicates through its open protocol port as well as the ability to adjust certain protocol parameters (such as baud rate, stop bits, parity, protocol mode, etc.).
- M. DUCT SYSTEM: Unit shall have factory-installed internal duct system. Individual zone heads shall be sized and located for connection to the existing zone systems. The return air opening shall include a protective grate. Zone balance dampers shall be provided when required to allow aggregate balancing of each zone on the building roof. Sub-zone control dampers actuators shall be easily accessible through external access panels without removing any screws, bolts, etc.
- N. ELECTRICAL: 460 volt, three phase with main over current protection device and branch circuit breakers shall be provided in each unit. Condensing unit disconnect switches shall be mounted on the exterior of the penthouse adjacent to the respective condensing units. A main electrical disconnect switch shall be factory mounted on each unit. Unit shall include a factory-installed power quality monitor to disable unit during phase loss, high voltage or low voltage conditions.
- O. WARRANTIES: The unit shall include the following manufacturer's parts only warranties with no labor allowance unless noted:
  1. Heat exchangers shall have a ten-year limited warranty with 50 °F minimum inlet air.

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2. Solid-state ignition modules shall have a one-year limited warranty.
3. Blower motors shall have a limited one-year warranty.
4. The compressor shall have a limited five-year warranty.
5. All other covered components shall have a limited one-year warranty.

**P. EQUIPMENT MANUFACTURER REQUIREMENTS:**

1. Inspect existing equipment and site prior to construction.
2. Complete system design to match equipment with building requirements.
3. Provide customized submittal data matching job requirements.
4. Fabricate all equipment in accordance with job schedule.
5. Control equipment delivery to meet schedule requirements.
6. Provide a project manager to supervise the installation.
7. Start-up equipment with the assistance of the installing contractor.
8. Complete detailed training of system operation, maintenance and troubleshooting for the owner.
9. Provide Operating and Maintenance instructions, including color-coded unit wiring diagrams showing actual wiring colors.

**PART 3 - EXECUTION**

**3.1 INSPECTION**

- A. Examine areas and conditions under which multizone units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

**3.2 INSTALLATION OF MULTIZONE UNITS**

- A. Install multizone units where indicated, in accordance with equipment manufacturer's instructions with unsatisfactory conditions corrected.
- B. Factory mounted integral disconnect switches shall be provided for all units.

**3.3 TESTING**

- A. Upon completion of installation of multizone units, start up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.

**3.4 CLEANING UP**

- A. Upon completion of work, remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

**END OF SECTION**



**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Furnish and install all necessary labor, materials, tools and equipment to perform and completely finish the work according to the intent of this specification, and the accompanying drawings.
- B. Furnish and install any incidental work which can reasonably be inferred as required and necessary to provide complete and workable systems.
- C. Provide connections of all equipment specified under these sections and other Divisions including Divisions 22 (Plumbing) and 23 (HVAC) including installation and connection of all motors, relays, remote starters, etc.
- D. The requirements of the General and Supplemental Conditions, and Division 01 apply to Divisions 26, 27 and 28, and these specifications. All sections in Divisions 26, 27, and 28 are interrelated. Work specified in other sections, as applicable, shall apply to all work hereunder.

**1.2 LOCAL CONDITIONS**

- A. Examine site; verify dimensions and locations against drawings and become informed of all conditions under which work is to be done before submitting proposal. No allowance will be made for extra expenses because of omission on Contractor's part to include cost of work under prevailing conditions.
- B. Information shown relative to services is based upon available records and data shall be regarded as approximate only. Minor deviations found necessary to conform with actual locations and conditions shall be made without extra cost.
- C. Extreme care shall be exercised in excavating near existing utilities to avoid any damage thereto. It shall be the contractor's responsibility to verify existing underground utilities prior to digging anywhere. Information provided on these plans indicating existing conditions shall only be used as reference, and shall not be deemed considered accurate. Any damage to existing utilities done by the contractor shall be repaired and/or replaced by the contractor at their expense to its pre-damage condition.

**1.3 PERMITS AND INSPECTIONS**

- A. Obtain and pay for all permits and service charges required in installation of the work. Arrange for required inspections and secure approvals from authorities having jurisdiction.
- B. During its progress, work shall be subject to inspection by Project Inspector.

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**1.4 CODES AND STANDARDS**

- A. Work and materials shall be in full accordance with California Occupational Safety Health Act (CAL-OSHA), California Electrical Code (CEC), State Fire Marshal, Electrical Safety Orders (Title 8, Subchapter 5), the National Fire Protection Association, California Building Code (CBC); California Code of Regulations - Title 24 and other applicable State or local laws or regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes.
- B. Electrical materials shall bear the label of, or be listed by, the Underwriter's Laboratories (UL) unless of a type for which label or listing service is not provided.
- C. Materials and components shall conform to Industry Standards, including:
  - 1. NEMA - National Electrical Manufacturer's Association
  - 2. ANSI - American National Standards Institute
  - 3. ASTM - American Society for Testing Material Association
  - 4. IPCEA - Insulated Power Cable Engineer's Association
  - 5. CBM - Certified Ballast Manufacturers
- D. When Contract Documents differ from governing codes, furnish and install larger size or higher standards called for without extra charge.

**1.5 REVIEW OF MATERIALS**

- A. Prior to commencement of Work and within 35 days after award of contract, submit for approval in accordance with General Conditions all equipment and materials to be furnished.
  - 1. Equipment/Product submittals shall be bound and indexed and shall include a table of contents listing all equipment submitted. The table of contents shall include: Project designation, submittal number, submittal name including specification section, date, and include manufacturer, model number, reference specification paragraph or sheet detail number, description, and page location. Where a group or series of products are submitted, each item does not have to be listed; only the series need to be identified. Example:

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Project:

Submittal No.

Submittal Name:

Date:

Spec para.,

Page(s)	Manufacturer	Model No.	Detail No.	Description
1-12	XYZ Corp	123ABC	2.5	Control panel
13,14	XYZ Corp	456DEF	2.6-A	Power supply
15	ABC Corp	789GHK	A/E9.5	Rack
16,17	Cantex	PVC-40	2.1	PVC conduit
18	Steel City	XYZ series	2.2	Steel fittings

2. Shop drawings submittals shall be neat and professionally done using CAD (computer aided drafting), hand-drawn submittals will not be accepted. Shop drawings shall have sufficient information to clearly indicate work to be performed and be complete including device/equipment locations, wire sizes, wire types and number of wires, symbol list or legend, point-to-point connections, wiring diagrams, and equipment anchorage detail where needed. Shop drawings shall utilize the same size paper as the Bid set of plans.

**B. Substitutions:**

1. Only one request for substitution will be considered on each item of material or equipment. No substitutions will be considered thereafter. Substitutions will be interpreted to be all manufacturers other than those specifically listed by model or catalog number. Should the original submittal of a proposed substitution be rejected, the specified item shall be furnished.
2. Submit complete information or catalog data to show equality of equipment or material offered to that specified. Identify which product is being substituted in the specifications and/or the plans and provide analysis as indicating either it "Complies" or that it "Does Not Comply" and providing a reason. Each Specification paragraph shall be provided with this analysis. No substitutions will be allowed unless requested and approved in writing. Materials of equal merit and appearance, in the opinion of the Engineer, will be approved for use. Engineer reserves the right to require originally specified item.
3. Acceptance of a substitute is not to be considered a release from the Specifications. Any deficiencies in an item, even though approved, shall be corrected by the Contractor at his expense.

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- 4. Responsibility for installation of approved substitution is included herein. Any changes required for installation of approved substituted equipment shall be made without additional cost to Owner.
- C. Where it is in the best interest of the Owner, Engineer may give written consent to a submittal received after expiration of designated time limits, or for an additional resubmittal.
- D. Submit for approval in ample time to avoid delay of construction, shop drawings or submittals on all items of equipment and materials covered in list mentioned above. Submit in accordance with General Conditions in a complete package; partial submittals will not be considered.
- E. Failure to comply with any of the preceding requirements will necessitate that the specified materials be submitted and supplied.

**1.6 RECORD DRAWINGS**

- A. Upon completion of Work, furnish Engineer with AutoCAD file, PDF file, and one printed full size hardcopy upon which shall be shown all Work installed under contract including any Work which are not in accordance with Original Contract Drawings. AutoCAD files shall be 2004 or later version, with external references bound to its parent drawing. Provide a separate PDF file for each sheet, do not combine all sheets into a single file. Furnish digital files on a USB flash drive or CD.
  - 1. The above shall also include shop drawings.
- B. All symbols and designations used in preparing Record Drawing shall match those used in Contract Drawings.
- C. Show all buried and concealed conduit, stub-outs, etc. Locate all buried conduit and stub-outs by dimensions from permanent, easily located and identifiable portions of structure; also, dimension ends of stub-outs, etc. Note depth of buried items below grade.

**1.7 ADDENDA AND CHANGE ORDERS**

- A. Changes in the plans and specifications shall be made by Addenda or Change Orders signed by the Engineer.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Materials mentioned herein or on drawings require that each item listed be provided and of quality noted, or an approved equal. All material shall be new, full weight and standard in all respects and in first-class conditions. Where possible, all materials used shall be of the same brand or manufacturer throughout for each class of material or equipment.

- B. Grade or quality of materials desired is indicated by trade names or catalog numbers stated herein. Dimensions, sizes and capacities shown are a minimum and shall not be changed without permission of Engineer.

### **PART 3 - EXECUTION**

#### **3.1 DRAWINGS AND COORDINATION**

- A. Examine Drawings and Site; be familiar with types of construction where electrical installation is involved. Work shall be neatly installed in a workmanlike manner in accordance with NECA Standard of Installation. Work shall be coordinated with other trades to avoid conflicts. Clarifications will be made by Engineer and minor adjustments shall be made without additional cost to Owner. Obtain ruling from Engineer concerning any obvious discrepancies or omissions in work before bidding. All work involved in correcting obvious errors or omissions after award of Contract shall be performed as directed by Engineer without additional cost to Owner.
- B. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial), but shall be followed as closely as possible. Drawings and Specifications are for assistance and guidance, and exact locations, distances, levels, etc., will be governed by Site.
- C. All equipment (devices, conduits, boxes, etc.) shall be flush or semi-flush mounted unless otherwise noted. Where conditions do not allow flush mounting and where acceptable to the Architect, equipment may be surface mounted.

#### **3.2 WORKING SPACE**

- A. Provide adequate working space around electrical equipment in compliance with Article 4 of Electrical Safety Orders. In general, provide 36 inches minimum clear work space in front of panelboards and controls of 120/208 volt systems and 42 inches minimum for 277/480 volt systems.

#### **3.3 CARE AND CLEANING**

- A. All broken, damaged or otherwise defective parts shall be repaired or replaced without additional cost to Owner. Work shall be left in a condition satisfactory to Engineer. At completion, carefully clean and adjust all equipment, fixtures and trim installed as part of this work. Systems and equipment shall be left in a satisfactory operating condition.
- B. All surplus materials and debris resulting from this work shall be cleaned out and removed from site; this includes surplus excavated material.

#### **3.4 EXCAVATING AND BACKFILLING**

- A. Excavate and backfill as required for installation of electrical work. Restore all surfaces, roadways, sod, walks, curbs, walls, existing underground installation, etc., cut by installations to original condition in an acceptable manner. Maintain all warning

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signs, barricades, flares and lanterns as required by the Safety Orders and local ordinances.

- B. Excavation: Dig trenches straight and true to line and grade, with bottom clear of any rock points. Minimum conduit depth of pipe crown shall be 24 inches below finished grade.
- C. Backfill: Support conduits with 2" sand bedding at bottom of trench. Provide sand backfill from bottom to 12" below finished grade. The top 12" to be local fine earth material free of rubble, rubbish or vegetation. Trenches shall be backfilled and compacted to 90% (per ASTM D1557) of maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

**3.5 PROTECTION**

- A. In performance of work, protect work from damage. Protect electrical equipment, stored and installed, from dust, water or other damage.

**3.6 EQUIPMENT IDENTIFICATION**

- A. Panelboards, remote control switches, terminal boxes, etc., shall be properly identified with a descriptive nameplate. Nameplate shall be made of 3/32 inch laminated plastic with black background and white letters. Size of letters shall be 1/4 inch high for equipment in device box or boxes 12" or smaller, and 1/2 inch high for panelboard, terminal can, or larger items. Letters shall be machine engraved. Punched strip type nameplates and cardholders in any form are not acceptable. Nameplates shall be attached with oval head machine screws tapped into front panel.
- B. Indicate type of equipment and equipment designation, ex. "PANEL-XXX", "MAIN SWITCHBOARD-XXX", "TRANSFORMER-XXX", "SIGNAL-XXX", "TV-XXX", "EF-1", "AC-1", etc.

**3.7 RUST INHIBITOR**

- A. Channels, joiners, hangers, straps, clamps, brackets, caps, nuts and bolts and associated parts shall be plated electrolytically with zinc followed immediately thereafter by treating freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of one hundred twenty (120) hours when subjected to a standard salt spray cabinet test, or shall be hot dipped galvanized.

**3.8 EQUIPMENT PADS**

- A. Concrete reinforced pads for mounting of equipment (i.e. switchboard, transformers, freestanding panels, etc.) shall be minimum 3000psi, 6" thick with #4 rebars at 12" on center each way. Rebars shall be centered in pad. Pad shall extend 2" beyond equipment and 1.5" above surrounding area. Backfill and compact to 95% maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

### **3.9 EQUIPMENT ANCHORAGE**

- A. Seismic Anchorage of Electrical equipment shall conform to the regulations of CBC-2019 and ASCE 7-16, Chapters 13 and 29. All equipment shall be braced or anchored to resist a horizontal force acting in any direction using the following criteria:
  - 1. The total design lateral seismic force shall be determined from section 1613A California Building Code (CBC) 2019 and 13.3 ASCE 7-16. Forces shall be applied in the horizontal directions, which results in the most critical loadings for design.
  - 2. The value of  $A_p$  (component amplification factor) and  $R_p$  (component response modification factor) of section 13.3.1 ASCE 7-16 shall be selected from section 13.6-1 ASCE 7-16. The value of  $I_p$  (seismic importance factor) shall be selected from 13.1.3 ASCE 7-16.
- B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the structural engineer and the District Engineer of the Division of The State Architect.

### **3.10 ARC FLASH**

- A. Electrical equipment such as switchboards, panelboards, load centers, motor control centers, industrial control panels, meter centers shall be field marked to warn persons of potential electric arc flash hazards per CEC 110.16 and NFPA 70E Standard for Electrical Safety in the Workplace. Minimum label wording shall be as follows:

DANGER

Arc Flash and Shock Hazard.

Appropriate PPE Required.

Do not operate controls or open doors without appropriate personal protection equipment.

Failure to comply may result in injury or death.

### **3.11 TEST**

- A. Test all wiring and connections for continuity and grounds; where such test indicate faulty insulation or other defects, locate, repair and retest. Balance loads at panelboards. Furnish all testing equipment.

### **3.12 CLOSING OF AN UNINSPECTED WORK**

- A. Do not allow or cause any of work installed hereunder to be covered up or enclosed before it has been inspected and approved.
- B. Should any work be enclosed or covered up before it has been approved, uncover such work and after it has been inspected and approved, make all repairs necessary to

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restore work of others to conditions in which it was found at time of cutting, all without additional cost to Owner.

**3.13 WARRANTY**

- A. All materials and installation shall be provided with a one (1) year warranty which shall include replacement parts, labor, retesting, and travel to and from the job site. The warranty period shall begin after final acceptance of the project. The warranty shall cover but is not limited to the following:
  - 1. Defective workmanship and installation.
  - 2. All System components, devices, conduit, wires, etc.
  - 3. Manufactured items such as light fixtures, receptacles, switchboard, panelboard, transformer, switches, etc.
  - 4. Basic materials such as conduit, wires, boxes, cabinets, etc.
- B. Certain manufactured items will have longer warranty periods. Refer to specific item and specification section for warranty information and terms.

**END OF SECTION**



**PART 1 - GENERAL****1.1 SCOPE**

- A. The work of this Section consists of basic materials and methods for all work included under Divisions 26, 27, and 28. Additional specifications requirements for electrical work are specified under other sections of Divisions 26, 27 and 28 and where those requirements differ from the requirements of this Section, they shall govern.

**1.2 SUBMITTALS**

- A. Submit product data per Section 26 0000.

**PART 2 - PRODUCTS****2.1 CONDUIT**

- A. Rigid Steel Conduit: Standard weight, mild steel pipe, zinc coated on both inside and outside by a hot dipping or sherardizing process. Inside and outside of conduit shall be finished with a protective coating. All threads galvanized after cutting. Meets UL 6, UL Card #DYIX, and ANSI C80.1.
- B. Intermediate Metallic Conduit (IMC): Intermediate weight, mild steel pipe, meeting same requirements for finish and material as rigid steel conduit. Meets UL 1242, UL Card #DYIX, and ANSI C80.6.
- C. Electrical Metallic Tubing (EMT): Cold rolled steel tubing, hot-dipped galvanized, with zinc coating on outside and protective lubricating coating on inside. Fittings shall meet same requirements for finish and material as EMT. Meets UL 797 and ANSI C80.3.
- D. Flexible Conduit: UL Listed. Flexible steel, zinc coated on both inside and outside by hot dipping or sherardizing process. Liquid-tight conduit shall be galvanized with extruded polyvinyl covering and with watertight connectors, sunlight resistant, direct burial rated. Flexible steel conduit less than 1/2" shall not be used except that 3/8" shall be permitted in lengths not in excess of 6 feet as part of a listed assembly or for tap connections to lighting fixtures as required in CEC Section 410-67(c). Flexible conduit to be one continuous length, no couplings. AFC Liquid-Tuff Type-LFMC and AFC Reduced Wall Flexible Steel Conduit, or equal.
- E. Raceway Fittings:
  - 1. Rigid Steel Conduit: Fittings, such as couplings, connectors, condulets, elbows, bends, etc., shall be subject to same requirements as for rigid steel conduit. Couplings and unions shall be threaded type, assembled with anti-corrosion, conductive anti-seize compound at joints made absolutely tight to exclude water. Connectors shall be threaded hubs with bonding insulated metallic bushings. Unions shall be equal to Crouse Hinds UNY or UNF.
  - 2. IMC: Fittings shall be as specified for rigid steel conduit.
  - 3. EMT: Fittings shall be steel, box connectors shall have insulated throat. Connectors and couplings to be compression type.

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4. Flexible Metallic Conduit: Connectors to be insulated. Metallic connectors (except for liquid-tight) shall be steel "squeeze" type via a screw, Steel City XC-90X and XC-49X series. Liquid-tight metallic connectors shall be watertight approved for such use.
  5. Bushings: Metallic insulated type. Weatherproof or dust-tight installations; liquid-tight with sealing ring and insulated throat, OZ/Gedney type "KR".
  6. Expansion and Deflection Fittings: OZ/Gedney, Type "DX" or accepted equal.
  7. All box connectors to be insulated throat type.
  8. Conduit Straps: Galvanized steel, 2-hole straps. 1-hole straps may be used for conduit sizes 1" and smaller concealed in wall or above ceiling.
- F. Metallic conduits, raceways, and fittings shall be listed and approved as a grounding means.

## **2.2 BOXES**

- A. Galvanized one-piece or welded pressed steel type. Boxes for fixture shall not be less than 4" square and shall be equipped with fixture stud. Boxes shall be at least 1-1/2" deep, 4" square for 1 or 2 gang devices, with plaster rings and gang box with gang cover. Boxes mounted in wall or ceiling finished with gypsum board shall be furnished with 3/4" deep plaster rings. Use screws and not nails to support/secure outlet boxes. Provide blank cover plates for all boxes without devices.
1. 1-gang and 2-gang outlet and junction boxes installed exposed outdoors shall be weatherproof type FS, FD, WS, WD die cast metal or aluminum boxes, Appleton or equal. Plug all unused hubs.
  2. Provide an equipment grounding pigtail at all receptacle, switch, and device outlet boxes. Ground conductor size to match circuit overcurrent protection complying with CEC.
  3. Outlet boxes for data, telecommunications, video, and TV outlets shall be 4 11/16" square x 2.125" deep.
  4. Outlet boxes containing #8, #6, or #4 AWG wires shall be a minimum 2.125" deep per CEC.
- B. Junction boxes located outdoors, or in wet or damp locations shall be rated NEMA-3R, with hinged door and pad-locking tabs.
- C. Equipment furnished by other trade but require electrical connection shall be provided with appropriate backbox.

## **2.3 WIRES**

- A. Wire shall be copper only, manufactured by General Cable Co., Rome, General Electric Co., or Anaconda. Wire shall be rated 90 degrees C for both dry and wet locations, THWN-2, XHHW-2, or RHW-2 insulation. 90 degrees C THHN may be used in dry and damp locations. Wire installed in high temperature areas, including branch circuits in or above roof insulation or in fluorescent ballast channel, shall have type RHW-2 or XHHW-2 90° insulation.

1. Feeders sized #2 and larger routed below grade, extending beyond or outside the building foundation line shall use types XHHW-2, THW-2, or RHW-2 insulation, 90 degrees C dry and wet rated.
- B. Wire shall be Code type copper wire of not less than 98% conductivity. Wires #8 gauge and larger, shall be stranded. Wires shall bear the Underwriters' label, be color coded and be marked with gauge, type and manufacturer's name on 24" centers. Wires smaller than #8 may be solid or stranded. Where stranded wire is used, provide solid pigtail for connection to screw terminals of receptacles, switches, etc.
- C. Color Coding to be as follows:

	208/120 Volts	480/277 Volts
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Grey
Ground	Green	Green

1. Switch legs shall use the same branch circuit phase color coding which they are connected to. IG ground wire shall be green with yellow tracer.
- D. Bring wire to job in original unbroken packages. Obtain approval of inspector or Engineer before installation of wires.

## 2.4 CONVENIENCE OUTLETS

- A. Shall be "Specification" grade rated 15 amperes at 125 volts, duplex, composition base with slots to accommodate parallel plug caps with grounding peg. Contact shall grip both sides of plug prongs. Where only one receptacle is connected to a 20 ampere circuit, a 20 ampere receptacle shall be used. Outlet shall be UL listed. Receptacles to be Hubbell or equal.
  1. 15 Amp: Hubbell 5262 series Heavy Duty Industrial Grade, 8200 series for Hospital Grade.
  2. 20 Amp: Hubbell 5362 series Heavy Duty Industrial Grade, 8300 series for Hospital Grade.
  3. Other designations as noted below:
    - a. Ground Fault: GFR
    - b. Tamper Resistant: TR
    - c. Weather Resistant: WR
    - d. Isolated Ground: IG
  4. Leviton 5252, 5352, 8200, and 8300 series can be considered equal.
  5. Pass & Seymour 5252, 5352, 8200, 8300 series can be considered equal.

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- B. Provide devices with matching plates. Isolated ground (IG) receptacles shall be orange with matching color plate. Hospital grade receptacles shall have a distinctive "green" dot. GFI receptacles shall have a visible (light) indicator.
- C. All 15 and 20 Amp, 125V and 250V non-locking receptacles (NEMA 5-15, 5-20, 6-15, 6-20) located outdoors and/or in damp or wet locations shall be listed weather-resistant type. Weather resistant receptacles shall be the same grade or class as 15A and 20A receptacles specified above.
- D. Weatherproof covers for receptacles in wet locations shall be rated as weatherproof whether or not a plug is inserted (NEMA-3R), minimum 3.25" clearance from front of receptacle, metallic cast type with hinged lid and padlocking hasp, Leviton or equal. Weatherproof covers for receptacles in damp locations shall be rated as weatherproof when attachment plug is removed, with metallic cast cover and flip lids with padlocking hasp.
- E. Provide a separate GFI duplex receptacle at each location identified on the drawings and as specified. Through wiring is not acceptable. Receptacles located at the following locations shall be GFI type, whether indicated in the plans or not.
  - 1. In elevator control rooms.
  - 2. In elevator pits/shafts.
  - 3. In bathrooms or restrooms.
  - 4. Outdoors, on the exterior of the building, and on/above the roof.
  - 5. In commercial and institutional kitchens, unless dedicated to specific equipment.
  - 6. Within 72" from any sink or basin such as in a small kitchen, lunch/break room, and the like.
- F. Provide an equipment grounding jumper (pigtail) connecting the grounding terminal of the receptacle to the grounded box.

## **2.5 SAFETY/DISCONNECT SWITCHES**

- A. Type "HD" Heavy Duty safety switches with externally operated handle. Switches shall be manufactured by Westinghouse, General Electric, Square D, or approved equal. Switches shall be rated 250 and 600 volts, A.C., of size and poles as shown on Drawings and as required. Disconnects used outdoor shall be in NEMA-3R. Provide fused switches with proper sized fuses where required by equipment manufacturer. All switches shall have pad-locking cover with interlocking cover. Switches shall be capable of be pad-lockable in the ON or OFF position. Label switch with circuit identification per section 26 0000, example "AC-1, HD1-24".

## **2.6 INDIVIDUAL CIRCUIT BREAKERS**

- A. Circuit breakers shall be molded case thermal magnetic type with trip rating as scheduled on drawings.
  - 1. Circuit breaker trip settings 300 amps and higher shall have Long-Time setting, STPU, STD, GFPU, Inst. PU settings. Breaker shall be solid state with field adjustable and replaceable trip rating plugs, or of the electronic type.

2. Circuit breakers with trip settings 1200 amps and higher shall be solid state electronic type with full function trip units including: LTPU, LTD, STPU, STD, Inst PU, Inst OFF, GFPU, GFD.
- B. Circuit breakers shall be quick-make, quick-break, trip free operation. The trip-free mechanism shall be independent of manual handle control. All circuit breakers shall be fully rated to withstand the available short circuit current as designated on the drawings. Series rated equipment will not be acceptable.
- C. Breakers to be in NEMA-1 (indoor) or NEMA-3R (damp, wet, and outdoor) enclosures. NEMA-3R enclosures shall have the handle concealed behind the cover, and the hinged cover shall be provided with padlocking tabs. Each circuit breaker shall be identified with an engraved, laminated phenolic plate showing the load served or the function of the circuit breaker and trip rating. The nameplate shall be attached with oval head machine screws tapped into the front of the board. Equip breaker handles with padlocking "lock-off" devices.

## **2.7 PULL LINE**

- A. Furnish and install pull line in all unused (empty) raceways. Pull lines shall not rot or mildew.
  1. Conduits up to 1.5": 1/8" diameter braided line of polypropylene with 200 lbs. tensile strength, IDEAL, Jet-Line #232, or equal.
  2. Conduits 2" or Larger: 3/16" polypropylene pull rope with 800 lbs. tensile strength, IDEAL Pro-Pull or equal.
- B. Provide pull line in conduits for utility company systems, size and type per their requirements.

## **2.8 ACCESS DOORS**

- A. Milcor, Newman or equal with concealed hinges, screwdriver locks, prime coated with rust inhibitive paint, and style of door to suit ceiling or wall construction, including fire rating. Access doors in acoustical tile ceilings shall be Hi-Hatch with tile recess. Doors shall be 14 gage C.R. steel and shall be 22" x 30"; 24" x 24" in tile ceilings, unless otherwise noted or required.

## **2.9 SURFACE METALLIC AND NONMETALLIC RACEWAYS**

- A. The surface raceway system for branch circuit wiring and/or data network, voice, video and other low-voltage wiring shall be manufactured by the Wiremold Company, or equal. Raceway series as indicated on the plans. The raceway and all system components must be UL listed and exhibit non-flammable self-extinguishing characteristics. The raceway shall be a two-piece design with a base and a snap-on cover.
  1. The nonmetallic raceway base and cover shall be manufactured of rigid PVC compound, available in ivory color. Exposed cuts shall be covered with cover clips.
  2. The metal raceway base and cover shall be manufactured of galvanized steel, ivory finish and suitable for field painting.

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- B. A full complement of fittings must be available including, but not limited to flat, internal and external elbows, tees, entrance fittings, boxes, covers, adapters, cover clips, and end caps. The fittings shall match the base and cover, and be of matching colors. All fittings shall be supplied with a base where applicable to eliminate mitering. A transition fitting shall be available to adapt to other Wiremold series raceways. Field cuts shall be clean, straight, and true with no rough edges.
- C. For multicompartment raceways, device brackets shall be available for mounting standard devices in-line or offset from the raceway. A device bracket shall be available for mounting up to four devices at one location. Faceplates shall match and fit flush in the device plate and shall overlay the cover and base to hide uneven cuts. They shall match the raceway base and cover. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP (i.e. data jacks), STP (150 ohm), Fiber Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting.
- D. Work shall include furnishing all raceway and appropriate fittings and device plates to install a nonmetallic surface raceway system. Installer shall comply with detailed manufacturer's instruction sheets, which accompany system components as well as system instruction sheets.
- E. Non-metallic raceway systems shall not be used in Assembly areas and other areas where the system is not rated for the installation. Assembly areas include but not limited to; gymnasiums, multipurpose rooms, auditoriums, conference rooms, etc.

#### **2.10 COVER PLATES**

- A. Switch and receptacle cover plates shall be smooth nylon type. Cover plates for other devices/outlets such as data, telephone, television, etc. shall be nylon. Cover plate color shall be ivory, matching all systems.
- B. For multi-purpose rooms, gymnasiums, kitchens, locker rooms, toilet/restrooms, and walls such as CMU, brick, concrete block, and concrete walls, device plates shall be smooth stainless steel with beveled edges.
- C. Each receptacle shall have its circuit identification on the cover plate (i.e., "LA1-12"). Use typewritten "clear tape". Use black letters/numbers for light colored (white, almond, tan, beige, etc.) cover plates. For darker colored cover plates (black, brown, gray, red, etc.), tape to be white with black letters/numbers. Tape shall be located at the lower portion of the cover plate. Clean surface before adhesive tape is applied, and wrap tape (approx. 1") at each end around back side of each cover plate.
  - 1. For floor boxes, plates shall be engraved with circuit identification.
  - 2. For light switches, use same circuit identification method as for receptacles.

## **PART 3 - EXECUTION**

### **3.1 CONDUITS & CIRCUITS**

- A. All conduits shall be rigid steel or IMC except EMT may be used at following locations:
  - 1. In dry locations in concealed furred spaces.

2. In partitions other than concrete, concrete block, or solid masonry.
  3. For exposed work indoors and outdoors above 10 ft except:
    - a. In special locations prohibited by Code, such as hazardous locations, rigid steel shall be used.
    - b. Conduits exposed on/above the roof shall be rigid steel up to 10 ft above roof surface.
    - c. Conduits exposed in Gymnasiums and Multi-Purpose Rooms shall be rigid steel up to 25 ft.
  4. Concealed above suspended ceilings or ceilings directly attached to structure above.
- B. Flexible Conduit: Shall be used to provide flexible connections of short length (3 ft or less) to equipment subject to vibration or movement and to all motors. Up to 6 ft is allowed where additional flexibility is needed. Provide a separate bonding conductor in all flexible connections/conduit. Flexible conduit shall be one continuous length without couplings.
1. Secure flex conduit within 12" of each box, cabinet, conduit body, or other termination, and maximum 4.5 ft on center. Refer to the CEC for other secure lengths where flexibility is required or in other specific instances.
- C. Run conduit concealed in areas having finished ceilings and in walls. Run all cross conduits and vertical risers or drops concealed in wall and/or partitions. Should it be necessary to notch any framing members, make such notching only at locations and in a manner as approved by the Architects. Where concealing conduit is not possible or practical, conduit may be run exposed in areas only where so permitted by the Architect. Install exposed conduit run neatly, parallel to or at right angles to structural members. Maintain a minimum of 6" clearance from steam or hot water pipes.
- D. Support conduit with straps and secure to wood structure by means of bolts or lag screws, to concrete by means of insert or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry by means of toggle bolts. Expanders and shields shall be steel or malleable iron.
- E. Do not install in concrete slabs.
- F. Support individual conduits with 2-hole steel straps. 1-hole steel straps may be used for conduits 1" and smaller concealed in wall or above ceilings.
- G. Galvanized iron hanger rods sizes 1/4" diameter and larger with spring steel fasteners, clips or clamps specifically designed for purpose for conduits up to 1" size may be used.
- H. Individual conduits 3/4" and smaller run above wire suspended ceilings may be supported from independent hanger wires with approved spring steel clips. Wire ties will not be acceptable. Wire shall be taut and secured to ceiling and structure above.
- I. Support multi-parallel horizontal conduit runs with trapeze type hangers consisting of two or more steel hanger rods, cross channels, J-bolts, clamps, etc.
- J. Sizes of rods and cross channels shall be designed to support four times actual load. Hanger rods shall have safety factor of 5 based on ultimate strength of material used.

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- K. Conduits for data, telecommunications, signal, video, TV, and/or containing fiber optic, coaxial, or OSP (outside plant) multi-pair cables shall have a minimum inside bend radius per CEC Table 346-10 (do not use exception); except that conduits 2" to 4" shall be minimum 24" radius bends.
- L. After installation of conductors, all conduits routed below grade shall be sealed at each opening, including risers and in pull boxes, to prevent the entrance of water and debris.
- M. Conduits not terminated into a box or cabinet, such as stubbed to a backboard, shall be terminated with an insulated bushing. Bushings for metallic conduits shall be metallic type secured by set screw, compression, or threaded type. Bushings for PVC conduits shall be glued in place.
- N. Although circuiting is shown as diagrammatic, their point-to-point destinations and their indication of above/below ground route shall be followed as much as possible. Where site conditions dictate that an alternate means of routing will alleviate conflicts, the alternate means will be considered with prior approval by the Engineer.
- O. Where cinder fill is encountered in Block walls, conduit shall be PVC-40 where in contact with cinder fill. Boxes shall be PVC type where in contact with cinder fill.
- P. EMT conduit circuits installed on the roof, if allowed by the Engineer, shall have a ground conductor routed with the circuit conductors sized per the circuit protective device.
- Q. Horizontal runs of conduit above suspended wire lay-in ceilings shall not be less than 12" above the ceiling.
- R. Maintain 12 inch separation between power circuits (>120V) and all signal circuits (data, telephone, speaker, clock, etc.) to prevent interference.
- S. Feeder conduits connected to panels/switchboard shall have ground lug bushing connected to equipment ground buss with ground wire same size as largest ground wire in the panel/switchboard.
- T. Conduits penetrating through the roof shall be secured within 12" below roof and supported within 12" of the penetration on the roof.
- U. Where conduits cross building expansion/seismic joints provide a short length of flexible conduit (do not exceed 6 ft.) and fittings listed as a grounding means, or in locations where flex conduit cannot be used provide UL listed expansion/seismic fittings.
- V. Conduits concealed in any masonry shall be routed in a conduit sleeve. Such sleeves shall not be placed closer than 3 diameters, center to center.
- W. Conduits to air conditioning (AC) equipment, fans, or other roof mounted equipment shall rise up from the ceiling below through the equipment curb or conduit window within the equipment, if allowed by equipment manufacturer, to prevent additional roof penetrations.



- X. Where conduit passes through finished walls or ceilings, provide steel escutcheon plates, chrome or painted as directed. Conduit which penetrate floor slabs, concrete or masonry walls shall be grouted and sealed watertight at penetrations.
- Y. For 20-amp 120 or 277 Volt Circuits using 90-deg C Wires:
  - 1. Do not install more than three(3) circuits in any conduit.
  - 2. Do not install more than six(6) current carrying conductors in any conduit.
  - 3. Where using #10 AWG wires to allow for conductor derating:
    - a. Do not install more than six(6) circuits in any conduit.
    - b. Do not install more than twelve(12) current carrying conductors in any conduit.
- Z. Cables and Raceways installed under metal-corrugated sheet roof decking shall maintain a minimum 1.5" from the nearest surface of the roof decking per CEC. This shall not apply to RMC or IMC.
- AA. Where switches control lighting loads supplied by a grounded branch circuit, the grounded conductor for the controlled lighting circuit shall be provided at the switch location. The grounded circuit conductor can be omitted where exceptions 1 & 2 apply. (CEC 404.2(C))

### **3.2 CAPPING**

- A. Cap conduits during construction with manufactured seals. Swab out conduits before wires are pulled in.
- B. Cap all empty conduits below grade and in pull boxes with manufacturer's caps to prevent entrance of water and debris, attach pull string to cap.

### **3.3 FLASHING**

- A. Make conduit projecting through roof watertight by proper flashing. Secure a sheet lead cap with a tightening bend to conduit. Use two collars for tar or asphalt composition roofings. Set one collar directly on roof deck and second collar set over on top of roofing felts. Lead sheet flashing shall be made of 4 lb. sheet lead. Use Stoneman #1100-4 series for individual conduits and #910/915 multi-flash for more than on conduit penetration, or equal.

### **3.4 PENETRATIONS OF FIRE RESISTIVE WALLS AND PARTITIONS**

- A. Penetrations of protected openings (fire rated walls, ceilings, floor-ceilings, roofs, etc.) shall be protected in accordance with the California Building Code, Part 2, Chapter 7, Title 24. Penetrations shall apply to conduits (raceways), cable trays, boxes, cabinets, panels, cables, etc.
- B. Fire stopping shall be provided at penetrations of fire resistive walls, floors, ceilings, floor-ceiling assemblies, and roofs. Fire-stopping shall have a "F" and/or "T" rating as determined by tests conducted in accordance with ASTM E 814 or UL-1479. Fire stopping system/materials shall be UL Listed.

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#### **3.5 ACCESS DOORS**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of electrical systems; for example, inaccessible areas and attics containing heat detectors, junction boxes, etc. Access doors shall provide for complete removal and replacement of equipment. Provide fire rated access doors where located in fire rated partitions.

#### **3.6 BOXES**

- A. Nails shall not be used to support outlet boxes. Boxes must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy-duty box hangers. For metal stud construction, use metal box hangers only. Box hangers shall be securely tied or welded (where permitted) or screwed to metal studs. Paint weld with rust inhibitor. Boxes installed in masonry tile or concrete block construction shall be secured with auxiliary plates, bars or clips and be grouted in place.
  - 1. Outlet Boxes with Receptacles or Switches: Provide a solid pigtail (green) ground wire grounded to the metallic outlet box. Pigtail shall also ground device and separate ground conductor if available. Size of ground wire to match overcurrent protection.
- B. Locate outlets at the following heights above floor to the center of the device or handle unless otherwise noted on Drawings or in Specifications.
  - 1. The top of the outlet box shall not be higher than 48" above finished floor, and the bottom of the outlet box shall not be less than 15" above finished floor. For forward or side approach over counter, maximum 44" and 46" respectively to top of box.
  - 2. Convenience Outlets: 18" (4" above counter or splash).
  - 3. Local Switches: 45".
  - 4. Telephone Outlets: 18" (45" for wall phone).
  - 5. Data, TV Outlets: 18".
  - 6. Where devices are shown at counter locations, they shall be located approximately 4" above counter, clearing back-splash where applicable.
  - 7. Refer to elevations and details on Architectural Drawings for exact heights and locations of all electrical outlets for switches, receptacles, special equipment, etc. Where above heights do not suit building construction or finish, consult Architect.
- C. Install pull boxes or junction boxes as required in accessible spaces but do not install in finished areas unless approved by Architect.
- D. Where fire rated construction is required (refer to Architectural Drawings), do not locate electrical outlet boxes back-to-back. Provide a minimum of 24" horizontal separation between outlet boxes on opposite side of the same wall. Where such restrictions cannot be met, provide fire-stopping around box such as 3M Moldable Putty Pads or equal.

- E. Boxes up to 100 cubic inches located in suspended wire ceilings may be supported through an independent hanger wire with approved tension clips. Wire shall be taut. Secure wire to the structure above and the ceiling below.

### 3.7 CONDUCTORS

- A. Splices and joints for #10 AWG or smaller wiring shall be twisted together electrically and mechanically strong and insulated with approved type insulated electrical spring connectors, Scotchlok or Ideal. Joints and connections for #8 AWG or larger shall be made with Burndy, T & B, or approved equal, solderless tool applied pressure lugs and connectors. Uninsulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and with all irregular surfaces properly padded with "Scotchfil" putty prior to application of tape. Tape shall be equal to Scotch #33, General Electric #AW-1, or approved equal. Feeder splicing is not permitted.
  - 1. In special instances where feeder splicing is allowed by the Engineer, it shall be made with high compression sleeve type connector followed by manufactured splicing kit utilizing as insulators, resins poured into a ready-to-use plastic mold to provide a uniform, moisture-proof tough, impact-resistant insulation.
  - 2. Conductor splices below grade shall meet ANSI C119.1-1986 and UL 486D Standards. Raychem WCSM or FCSM heavy wall heat shrink tubing; or RVS or RVC series if use of flame heat is prohibited. Conductors to be joined with compression sleeve connectors.
- B. Use only UL approved wire pulling compound as lubricant.
- C. Lace conductors together with waxed linen lacing cord, T & B "Ty-Rap", Holub "Quik-Wrap" or equal, in a neat and workmanlike manner in panelboards, wireways, raceways, pull boxes and similar locations.
- D. #12 AWG wire shall be minimum size wire used for lighting and power circuits. Motor control circuits may be #14 except as marked on Drawings, unless shown.
- E. Provide cable supports in risers by means of a clamping device with insulated wedges or "Kellem" grips.
- F. All conductors shall be in conduit unless otherwise indicated.
- G. Conduit sizes shall be based on code fill table for THW insulated wires to accommodate the number, size, and type of wires shown or specified.
- H. Wiring installed in pull boxes or junction boxes, where wire is pulled through without terminations (except splices), shall have a service loop around the interior of the box for 360 degrees utilizing the largest circumference.
- I. Use #10 AWG conductor for 20 Amp 120 Volt circuit home runs longer than 75 feet, and for 20 Amp 277 Volt circuit homeruns longer than 200 feet.
- J. Where conductors are increased in size and number (such as for voltage drop reasons), such that conductors will not fit the standard breaker or panel lugs, terminate conductors in one of the following means:
  - 1. Provide larger breaker frame or panelboard.

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2. Provide oversized lugs.
3. Last Option only with Approval from Engineer: Terminate wires in multiport connector and provide pigtail. Splice to be made in panel or switchboard if space is available, or in separate splice box. This option will not be normally granted.

### **3.8 PANELS AND CABINETS**

- A. Recessed enclosures (panelboards, terminal cabinets, cabinets, control cabinets, etc.) shall be provided with a minimum of three 3/4" empty conduits stubbed into accessible space above the ceiling. Drawings may require additional conduits.

### **3.9 GROUNDING**

- A. Grounding and ground bonding of the electrical installation shall be in accordance with CEC Article 250, and any applicable codes. Ground fittings shall be approved manufactured type, installed and connected to conform with Code requirements.
- B. Neutral conductors and noncurrent-carrying parts of equipment at each installation shall be grounded in accordance with applicable code. Ground conductor shall be copper having a current capacity sized in accordance with CEC.
- C. All equipment cases, motor frames, etc., shall be completely grounded to satisfy requirements of CEC. Install bond wire in flexible conduit. Install copper bond wire, sized in accordance with CEC, in all nonmetallic raceways and bond to all metallic parts using approved fittings.
- D. Service ground conductor shall be connected to a "Ufer" encased ground and bonded to the metallic cold water pipe system and to the metallic natural gas line.
- E. Interior metallic cold water pipe system and other interior metallic piping systems shall be ground bonded to the building grounding system.
- F. Each building shall be provided with a grounding electrode connected to the metallic enclosure of the building disconnecting means. Grounding electrode conductor shall be sized per CEC table 250-66.
- G. Total ground resistance shall not exceed 25 ohms.
- H. All connections shall be made with solderless connectors or molded fusion-welding process.
- I. Equipment grounding conductors shall be insulated with a continuous green outer finish along its entire length. Conductors size #4 AWG and larger may be identified (with green electrical tape applied half-lapped) at each end and at every point where the conductor is accessible. Tape shall be applied from its point of entry to point of exit or termination.
- J. Insulated grounded (neutral) conductors shall be identified with a continuous white outer finish along its entire length. Neutral conductors #4 AWG or larger can be identified by a distinctive white marking (applied half-lapped with white electrical tape) for the last 12 inches at each end.

**3.10 FIELD TESTS**

- A. General: Perform field test in the presence of the Owner's Representative except as otherwise specified. Provide required labor, materials, equipment and connections to perform tests. Document results and submit them to the Owner's Representative. Repair or replace all defective work.

**3.11 GROUND FAULT PROTECTION AND TESTING**

- A. Where indicated on the plans, provide circuit breaker with ground fault protection. The ground fault system shall include a memory circuit for positive tripping action despite intermittent arcing ground faults.
- B. Provide an integral means of testing the ground fault system to meet the on-site requirements of CEC Articles 230 and 517.
- C. Provide acceptance testing per InterNational Electrical Testing Association Inc. (NETA) specifications and standards. Submit test results.

**3.12 CLEANING**

- A. Brush and clean work prior to concealing, painting and acceptance. Performed in stages if directed.
- B. Clean and repair soiled or damaged painted exposed work and match adjoining work before final acceptance.
- C. Remove debris from inside and outside of material, equipment and structures.

**3.13 WARRANTY**

- A. All materials and installation shall be provided with a one (1) year warranty which shall include replacement parts, labor, retesting, and travel to and from the job site. The warranty period shall begin after final acceptance of the project.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes electrical connections to equipment.
- B. Related Sections:
  - 1. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cable.
  - 2. Section 26 0533 - Raceway and Boxes for Electrical Systems.

### **1.2 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

### **1.3 SUBMITTALS**

- A. Section 01 3300 - Submittal Procedures.
- B. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's installation instructions.

### **1.4 CLOSEOUT SUBMITTALS**

- A. 017700 - Closeout Procedures.

### **1.5 COORDINATION**

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

## **PART 2 - PRODUCTS**

### **2.1 CORD AND PLUGS**

- A. Manufacturers:
  - 1. Leviton.
  - 2. Arrow Hart.

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3. Pass & Seymour.
  4. Eagle.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
  - C. Configuration: NEMA WD 6; match receptacle configuration at outlet furnished for equipment.
  - D. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify equipment is ready for electrical connection, for wiring, and to be energized.

### **3.2 EXISTING WORK**

- A. Remove exposed abandoned equipment wiring connections, including abandoned connections above accessible ceiling finishes.
- B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.
- C. Extend existing equipment connections using materials and methods compatible with existing electrical installations.

### **3.3 INSTALLATION**

- A. Make electrical connections.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install receptacle outlet to accommodate connection with attachment plug.
- E. Install cord and cap for field-supplied attachment plug.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

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- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**3.4 ADJUSTING**

- A. Section 01 7300 and 01 7700 - Execution and Closeout Procedures.
- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 DESCRIPTION**

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

### **1.2 MINIMUM REQUIREMENTS**

- A. The latest California Building Code (CBC), Underwriters Laboratories, Inc. (UL), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

### **1.3 TEST STANDARDS**

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
  - 1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing

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states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.

2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified: Materials and equipment which:
  - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
  - b. Are periodically inspected by a NRTL.
  - c. Bear a label, tag, or other record of certification.
4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

**1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)**

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
  1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
  2. The District reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

**1.5 APPLICABLE PUBLICATIONS**

- A. Applicable publications listed in all Sections of Division 26 shall be the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

**1.6 MANUFACTURED PRODUCTS**

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.

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- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
  - 1. Components of an assembled unit need not be products of the same manufacturer.
  - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  - 3. Components shall be compatible with each other and with the total assembly for the intended service.
  - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer. In addition, the following requirements shall be complied with:
  - 1. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to EOR fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
  - 2. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer. The Contractor shall be liable for all additional expenses for the EOR to witness factory re-testing.

**1.7 MATERIALS AND EQUIPMENT PROTECTION**

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
  - 1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
  - 2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
  - 3. Damaged equipment shall be repaired or replaced, as determined by the IOR.
  - 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
  - 5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

**1.8 WORK PERFORMANCE**

- A. All electrical work shall comply with requirements of the latest NFPA 70 (NEC and CEC), NFPA 70B, NFPA 70E, NFPA 99, NFPA 110, OSHA Part 1910 subpart J – General Environmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.

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- B. Job site safety and worker safety is the responsibility of the Contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. However, energized electrical work may be performed only for the non-destructive and non-invasive diagnostic testing(s), or when scheduled outage poses an imminent hazard to patient care, safety, or physical security. In such case, all aspects of energized electrical work, such as the availability of appropriate/correct personal protective equipment (PPE) and the use of PPE, shall comply with the latest NFPA 70E, as well as the following requirements:
  - 1. Only Qualified Person(s) shall perform energized electrical work. Supervisor of Qualified Person(s) shall witness the work of its entirety to ensure compliance with safety requirements and approved work plan.
  - 2. At least two weeks before initiating any energized electrical work, the Contractor and the Qualified Person(s) who is designated to perform the work shall visually inspect, verify and confirm that the work area and electrical equipment can safely accommodate the work involved.
  - 3. At least two weeks before initiating any energized electrical work, the Contractor shall develop and submit a job specific work plan, and energized electrical work request to EOR and IOR. At the minimum, the work plan must include relevant information such as proposed work schedule, area of work, description of work, name(s) of Supervisor and Qualified Person(s) performing the work, equipment to be used, procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
  - 4. Energized electrical work shall begin only after the Contractor has obtained written approval of the work plan, and the energized electrical work request from IOR and utility inspector. The Contractor shall make these approved documents present and available at the time and place of energized electrical work.
  - 5. Energized electrical work shall begin only after the Contractor has invited and received acknowledgment from IOR and utility inspector to witness the work.
- D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article WORK SEQUENCE under Section 01 1100, SUMMARY OF WORK.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 7329, CUTTING AND PATCHING.
- F. Coordinate location of equipment and conduit with other trades to minimize interference.

**1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the CEC.
- C. Inaccessible Equipment:

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1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
  2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

**1.10 EQUIPMENT IDENTIFICATION**

- A. In addition to the requirements of the CEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:
1. Nominal system voltage.
  2. Equipment/bus name, date prepared, and manufacturer name and address.
  3. Arc flash boundary.
  4. Available arc flash incident energy and the corresponding working distance.
  5. Minimum arc rating of clothing.
  6. Site-specific level of PPE.

**1.11 SUBMITTALS**

- A. Submit to EOR in accordance with Section 01 3300, SUBMITTAL PROCEDURES.
- B. The EOR's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.

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- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the EOR to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals per spec section 01 3300.
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
  - 2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
  - 3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
  - 1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
  - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
  - 3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
  - 4. The manuals shall include:

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- a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
  - b. A control sequence describing start-up, operation, and shutdown.
  - c. Description of the function of each principal item of equipment.
  - d. Installation instructions.
  - e. Safety precautions for operation and maintenance.
  - f. Diagrams and illustrations.
  - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
  - h. Performance data.
  - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
  - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.
- H. After approval and prior to installation, furnish the //Resident Engineer// //COR// with one sample of each of the following:
- 1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
  - 2. Each type of conduit coupling, bushing, and termination fitting.
  - 3. Conduit hangers, clamps, and supports.
  - 4. Duct sealing compound.
  - 5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

**1.12 SINGULAR NUMBER**

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

**1.13 ACCEPTANCE CHECKS AND TESTS**

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all

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components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the District.

- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests for the equipment. Repair, replacement, and re-testing shall be accomplished at no additional cost to the District.

**1.14 WARRANTY**

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the District.

**1.15 INSTRUCTION**

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the District at least 30 days prior to the planned training.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

### **1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Field quality-control test reports.

### **1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### **2.2 CONDUCTORS AND CABLES**

- A. Manufacturers:
  - 1. American Insulated Wire Corp.; a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THW, THHN-THWN2 or XHHW2 complying with NEMA WC 5 or 7.

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- E. Multiconductor Cable: Metal-clad cable, Type MC with ground wire. MC shall not be used unless approved prior to installation by the school district.

**2.3 CONNECTORS AND SPLICES**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. AMP Incorporated/Tyco International.
  - 3. Hubbell/Anderson.
  - 4. O-Z/Gedney; EGS Electrical Group LLC.
  - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**PART 3 - EXECUTION**

**3.1 CONDUCTOR AND INSULATION APPLICATIONS**

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN 2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC shall not be used without notice of approval from the school district.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

**3.2 INSTALLATION**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

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- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 0500 "Common Work Results for Electrical."
- F. Identify and color-code conductors and cables according to Section 26 0500 "Common Work Results for Electrical."
- G. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- H. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

**3.3 FIELD QUALITY CONTROL**

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

**1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For ground rods.
  - 1. Field quality-control test reports.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**1.4 GROUNDING ELECTRODE SYSTEM**

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Concrete-encased electrode.
- D. Rod electrode.

**1.5 PERFORAMNCE REQUIREMENTS**

- A. Grounding System Resistance: 5 ohms.

**1.6 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate all resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include all instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

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**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cadweld.
  2. Thermoweld.
  3. Copperweld Corp.
  4. Dossert Corp.
  5. Erico Inc.; Electrical Products Group.
  6. Galvan Industries, Inc.
  7. Harger Lightning Protection, Inc.
  8. Hastings Fiber Glass Products, Inc.
  9. ILSCO.
  10. Kearney/Cooper Power Systems.
  11. Korns, C. C. Co.; Division of Robroy Industries.
  12. Lyncole XIT Grounding.
  13. O-Z/Gedney Co.; a business of the EGS Electrical Group.
  14. Burndy "Hyground" compression system
  15. Thomas & Betts, compression system

**2.2 GROUNDING CONDUCTORS**

- A. For insulated conductors, comply with Section 26 0519 "Low-Voltage Power Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.
- N. Foundation Electrode: 4/0 AWG.

## **2.3 ROD ELECTRODES**

- A. Ground Rods: Copper-clad steel.
  - 1. Size: 3/4 inch diameter by 120 inches.
  - 2. Manufacturer: Blackburn; Eritech; Or equal.

## **2.4 GROUNDING WELL COMPONENTS**

- A. Well Pipe: 12 inch diameter by 24 inches long concrete pipe with belled end.
- B. Well Cover: Cast iron with legend 'GROUND' embossed cover.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
- E. Equipment Grounding Conductors: Comply with CEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by CEC are indicated.
  - 1. Install insulated equipment grounding conductors in feeders.
  - 2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at

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- equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
  4. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
    - a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
    - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
  2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- G. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- H. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- I. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  2. Make connections with clean, bare metal at points of contact.
  3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
  5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
  6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
  8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
  9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
  10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
  11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- J. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- K. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

### **3.2 FIELD QUALITY CONTROL**

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
  2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.



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3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
  - a. Equipment Rated 500 kVA and Less: 10 ohms.
  - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
  - c. Equipment Rated More Than 1000 kVA: 3 ohms.
  - d. Manhole Grounds: 10 ohms.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Steel slotted support systems.
  - 2. Aluminum slotted support systems.
  - 3. Nonmetallic slotted support systems.
  - 4. Conduit and cable support devices.
  - 5. Support for conductors in vertical conduit.
  - 6. Structural steel for fabricated supports and restraints.
  - 7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
  - 8. Fabricated metal equipment support assemblies.
- B. Related Requirements:
  - 1. Section 26 0548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
    - d. Sockets.
    - e. Eye nuts.
    - f. Fasteners.
    - g. Anchors.
    - h. Saddles.
    - i. Brackets.
  - 2. Include rated capacities and furnished specialties and accessories.

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- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
  - 1. Hangers. Include product data for components.
  - 2. Slotted support systems.
  - 3. Equipment supports.
  - 4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for electrical systems.
  - 1. Include design calculations and details of hangers.
  - 2. Include design calculations for seismic restraints.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Ductwork, piping, fittings, and supports.
  - 3. Structural members to which hangers and supports will be attached.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Items penetrating finished ceiling, including the following:
    - a. Luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
    - f. Projectors.
- B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.

## **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M.
  - 2. AWS D1.2/D1.2M.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
  - 2. Component Importance Factor: 1.5 or 1.0.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

### **2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. ERICO International Corporation.
    - d. Flex-Strut Inc.
    - e. GS Metals Corp.
    - f. G-Strut.
    - g. Haydon Corporation.
    - h. Metal Ties Innovation.
    - i. Thomas & Betts Corporation; A Member of the ABB Group.
    - j. Unistrut; Part of Atkore International.
    - k. Wesanco, Inc.

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2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Material for Channel, Fittings, and Accessories: Galvanized steel.
  1. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
  2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Cooper Industries, Inc.
    - b. Flex-Strut Inc.
    - c. Haydon Corporation.
    - d. MKT Metal Manufacturing.
    - e. Thomas & Betts Corporation; A Member of the ABB Group.
    - f. Unistrut; Part of Atkore International.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Material: 6063-T5 aluminum alloy.
  4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
  5. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
  6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. Fabco Plastics Wholesale Limited.
    - d. G-Strut.
    - e. Haydon Corporation.
    - f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches or 13/16 inches.
  4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
  5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
  6. Rated Strength: Selected to suit applicable load criteria.
  7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.

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2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - 1) B-line, an Eaton business.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti, Inc.
    - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All Stainless - steel springhead type.
7. Hanger Rods: Threaded steel.

**2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

**PART 3 - EXECUTION**

**3.1 APPLICATION**

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  1. NECA 1.
  2. NECA 101
  3. NECA 102.
  4. NECA 105.
  5. NECA 111.
- B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least **25** percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

### **3.2 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.



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- 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

**3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

- A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

**3.4 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.5 PAINTING**

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 09 9113 "Exterior Painting"/Section 09 9123 "Interior Painting" and Section 09 9600 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

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- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

**1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer's specified.

**2.2 METAL CONDUIT AND TUBING**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflec Inc.
  - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 4. Electri-Flex Co.
  - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
  - 6. LTV Steel Tubular Products Company.
  - 7. Manhattan/CDT/Cole-Flex.
  - 8. O-Z Gedney; Unit of General Signal.
  - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.

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- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. EMT and Fittings: ANSI C80.3.
  - 1. Fittings: Compression type.
- F. FMC: Aluminum.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

**2.3 NONMETALLIC CONDUIT AND TUBING**

- A. Manufacturers:
  - 1. American International.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. Arnco Corp.
  - 4. Cantex Inc.
  - 5. Certainteed Corp.; Pipe & Plastics Group.
  - 6. Condux International.
  - 7. ElecSYS, Inc.
  - 8. Electri-Flex Co.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Manhattan/CDT/Cole-Flex.
  - 11. RACO; Division of Hubbell, Inc.
  - 12. Spiralduct, Inc./AFC Cable Systems, Inc.
  - 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

**2.4 SURFACE RACEWAYS**

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
  - 1. Manufacturers:
    - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
    - b. Thomas & Betts Corporation.
    - c. Walker Systems, Inc.; Wiremold Company (The).
    - d. Wiremold Company (The); Electrical Sales Division.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

## **2.5 BOXES, ENCLOSURES, AND CABINETS**

### **A. Manufacturers:**

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.

### **B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.**

### **C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.**

### **D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.**

### **E. Floor Boxes: Cast metal, fully adjustable, rectangular.**

### **F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.**

### **G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.**

### **H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.**

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

### **I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.**

## **2.6 FACTORY FINISHES**

### **A. Finish: For raceway, enclosures, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.**

## **PART 3 - EXECUTION**

### **3.1 RACEWAY APPLICATION**

#### **A. Outdoors:**

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.

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3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
1. Exposed: EMT.
  2. Concealed: EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  4. Damp or Wet Locations: Rigid steel conduit.
  5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

**3.2 INSTALLATION**

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Section 26 0500 "Common Work Results For Electrical."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

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1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  2. Space raceways laterally to prevent voids in concrete.
  3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
  2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a

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flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where otherwise required by CEC.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

**3.3 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
  - 2. USB charger devices.
  - 3. GFCI receptacles.
  - 4. Twist-locking receptacles.
  - 5. Pendant cord-connector devices.
  - 6. Cord and plug sets.
  - 7. Toggle switches.
  - 8. Decorator-style convenience.
  - 9. Wall switch sensor light switches with ultrasonic sensors.
  - 10. Digital timer light switches.
  - 11. Wall-box dimmers.
  - 12. Wall plates.
  - 13. Floor service outlets.
  - 14. Poke-through assemblies.
  - 15. Prefabricated multioutlet assemblies.
  - 16. Service poles.

### **1.3 DEFINITIONS**

- A. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

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- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- H. UTP: Unshielded twisted pair.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

**PART 2 - PRODUCTS**

**2.1 GENERAL WIRING-DEVICE REQUIREMENTS**

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

**2.2 STRAIGHT-BLADE RECEPTACLES**

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  2. Eaton (Arrow Hart).
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Leviton Manufacturing Co., Inc.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
- B. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- C. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

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2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

**2.3 USB CHARGER DEVICES**

- A. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
  3. USB Receptacles: Type A.
  4. Line Voltage Receptacles: two pole, three wire, and self-grounding.
- B. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, UL 1310, and FS W-C-596.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
  3. USB Receptacles: Type A.
  4. Line Voltage Receptacles: two-pole, three wire, and self-grounding.

**2.4 GFCI RECEPTACLES**

- A. General Description:
  1. 125 V, 20 A, straight blade, non-feed-through type.
  2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Pass & Seymour/Legrand (Pass & Seymour).
- D. Hospital-Grade, Duplex GFCI Convenience Receptacles: Comply with UL 498 Supplement sd.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

## **2.5 SPD RECEPTACLES**

- A. General Description: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.
  1. 125 V, 20 A, straight-blade type.
  2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
  3. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

## **2.6 TWIST-LOCKING RECEPTACLES**

- A. Twist-Lock, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).

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- b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- B. Twist-Lock, Isolated-Ground, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Grounding: Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

**2.7 PENDANT CORD-CONNECTOR DEVICES**

- A. Description:
  - 1. Matching, locking-type plug and receptacle body connector.
  - 2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
  - 3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
  - 4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

**2.8 CORD AND PLUG SETS**

- A. Description:
  - 1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
  - 3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

**2.9 TOGGLE SWITCHES**

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  2. Two Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  3. Three Way:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  4. Four Way:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
- C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

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- D. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- E. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- G. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.



- c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- H. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- I. Toggle Switches: Square Face, 120/277 V, 15 A; comply with NEMA WD 1, UL 20, and FS W-S-896.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- J. Lighted Toggle Switches: Square Face, 120 V, 15 A; comply with NEMA WD 1 and UL 20.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: With LED-lighted handle, illuminated when switch is off.

## **2.10 WALL SWITCH SENSOR LIGHT SWITCH, ULTRASONIC**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.

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- B. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
  - 1. Connections: Provisions for connection to BAS.
  - 2. Connections: Hard wired.
  - 3. Connections: Wireless.
  - 4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
  - 5. Integral relay for connection to BAS.
  - 6. Adjustable time delay of 20 minutes.
  - 7. Able to be locked to Manual-On mode.
  - 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
  - 9. Comply with NEMA WD 1, UL 20, and FS W-S-896.

**2.11 DIGITAL TIMER LIGHT SWITCH**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.
- B. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
  - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
  - 2. Integral relay for connection to BAS.

**2.12 WALL-BOX DIMMERS**

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
  - 1. 600 W; dimmers shall require no derating when ganged with other devices.
- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

- E. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

## **2.13 WALL PLATES**

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
  - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

## **2.14 POKE-THROUGH ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Pass & Seymour/Legrand (Pass & Seymour).
  - 3. Square D; by Schneider Electric.
  - 4. Wiremold / Legrand.
- B. Description:
  - 1. Factory-fabricated and -wired assembly of below-floor junction box with multi-channelled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
  - 2. Comply with UL 514 scrub water exclusion requirements.
  - 3. Service-Outlet Assembly: Pedestal type with services indicated complying with requirements in Section 27 1513 "Communications Copper Horizontal Cabling."
  - 4. Size: Selected to fit nominal cored holes in floor and matched to floor thickness.
  - 5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
  - 6. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
  - 7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 27 1513 "Communications Copper Horizontal Cabling."

## **2.15 PREFABRICATED MULTIOUTLET ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

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1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold / Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

**2.16 FINISHES**

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPD Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan-speed control are listed for that application.
  3. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

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- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

**3.2 GFCI RECEPTACLES**

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

**3.3 IDENTIFICATION**

- A. Comply with Section 26 0511 "Requirements for Electrical Installations".
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

**3.4 FIELD QUALITY CONTROL**

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
  - 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
  - 2. Test Instruments: Use instruments that comply with UL 1436.
  - 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 3. Using the test plug, verify that the device and its outlet box are securely mounted.
- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Receptacle switches.
  - 4. Shunt trip switches.
  - 5. Molded-case circuit breakers (MCCBs).
  - 6. Molded-case switches.
  - 7. Enclosures.

### **1.3 DEFINITIONS**

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.

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1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:
    - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  2. Fuse Pullers: Two for each size and type.

**1.8 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Accredited by NETA.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.



## **1.9 FIELD CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

## **1.10 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: three year(s) from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

### **2.2 GENERAL REQUIREMENTS**

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

### **2.3 FUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. ABB Inc.
  - 2. Eaton.
  - 3. General Electric Company.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.

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5. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
1. Single throw.
  2. Three pole.
  3. 600-V ac.
  4. 200 A and smaller.
  5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
  6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac
  6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  8. Service-Rated Switches: Labeled for use as service equipment.

**2.4 NONFUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Eaton.
  2. General Electric Company.
  3. SIEMENS Industry, Inc.; Energy Management Division.
  4. Square D; by Schneider Electric.
- B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

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- C. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Three Pole, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac
  - 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 8. Service-Rated Switches: Labeled for use as service equipment.

**2.5 RECEPTACLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

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- D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- E. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
  - 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 8. Service-Rated Switches: Labeled for use as service equipment.

**2.6 SHUNT TRIP SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Bussmann, an Eaton business.
  - 2. Littelfuse, Inc.
  - 3. Mersen USA.
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

- E. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer or source of enough capacity to operate shunt trip, pilot, indicating and control devices.
- F. Accessories:
  - 1. Oiltight key switch for key-to-test function.
  - 2. Oiltight red ON pilot light.
  - 3. Isolated neutral lug; 100 or 200 percent rating.
  - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  - 5. Form C alarm contacts that change state when switch is tripped.
  - 6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac or 24-V dc coil voltage.
  - 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
  - 8. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 9. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 10. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 11. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
  - 12. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 13. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 14. Service-Rated Switches: Labeled for use as service equipment.

## **2.7 MOLDED-CASE CIRCUIT BREAKERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. NOARK Electric North America.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.
  - 5. Square D; by Schneider Electric.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker

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handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. \_\_\_\_\_ Amps Available. Identical Replacement Component Required."
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 167 deg F rated wire, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
- G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
  - 1. Instantaneous trip.
  - 2. Long- and short-time pickup levels.
  - 3. Long- and short-time time adjustments.
  - 4. Ground-fault pickup level, time delay, and I-squared t response.
- K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

- N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- O. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical/Compression type, suitable for number, size, trip ratings, and conductor material.
  - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered or remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 5. Communication Capability: Circuit-breaker-mounted, Universal-mounted or Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 26 0913 "Electrical Power Monitoring and Control."
  - 6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
  - 9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
  - 10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
  - 11. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
  - 12. Electrical Operator: Provide remote control for on, off, and reset operations.
  - 13. Accessory Control Power Voltage: Integrally mounted, self-powered.

## **2.8 MOLDED-CASE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. NOARK Electric North America.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.
  - 5. Square D; by Schneider Electric.

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- B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- D. Features and Accessories:
  - 1. Standard frame sizes and number of poles.
  - 2. Lugs:
    - a. Mechanical/Compression type, suitable for number, size, trip ratings, and conductor material.
    - b. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 167 deg F rated wire, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
  - 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
  - 7. Alarm Switch: One NC contact that operates only when switch has tripped.
  - 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
  - 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
  - 10. Electrical Operator: Provide remote control for on, off, and reset operations.
  - 11. Accessory Control Power Voltage: Integrally mounted, self-powered.

**2.9 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1 or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R)
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover or directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R).



The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

#### **3.2 PREPARATION**

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Architect, Construction Manager and Owner written permission.
  - 4. Comply with NFPA 70E.

#### **3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS**

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

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5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 with cover attached by Type 316 stainless steel bolts.

**3.4 INSTALLATION**

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Section 26 0548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

**3.5 IDENTIFICATION**

- A. Comply with Section 26 0511 "Requirements for Electrical Installations".
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

**3.6 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections for Switches:
  1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.

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- c. Verify that the unit is clean.
  - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
  - e. Verify that fuse sizes and types match the Specifications and Drawings.
  - f. Verify that each fuse has adequate mechanical support and contact integrity.
  - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
  - i. Verify correct phase barrier installation.
  - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
2. Electrical Tests:
- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
  - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

F. Tests and Inspections for Molded Case Circuit Breakers:

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1. Visual and Mechanical Inspection:
  - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, grounding, and clearances.
  - d. Verify that the unit is clean.
  - e. Operate the circuit breaker to ensure smooth operation.
  - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
  - h. Perform adjustments for final protective device settings in accordance with the coordination study.
2. Electrical Tests:
  - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
  - e. Determine the following by primary current injection:

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- 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
  - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
  - f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
  - g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
  - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
  - i. Verify operation of charging mechanism. Investigate units that do not function as designed.
  3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  4. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- G. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports.
1. Test procedures used.

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2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

**3.7 ADJUSTING**

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0573.16 "Coordination Studies."

**END OF SECTION**



# Project Manual

## Victor Elementary School - HVAC Replacement

Lodi Unified School District

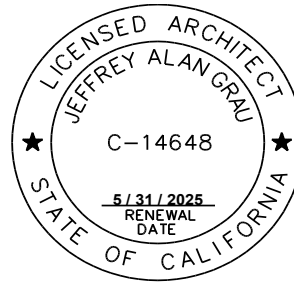
Lodi, California

RGA Job Number 3431005

September 22, 2023

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Work included.
  - 2. Work by others.
  - 3. Dimensional tolerances for accessibility.
  - 4. Contractor's use of premises.
  - 5. Work sequence.
  - 6. Owner occupancy.
  - 7. Existing utilities.
  - 8. Asbestos.

**1.2 WORK INCLUDED**

- A. Under a single contract construct the Victor Elementary School - HVAC Replacement, Lodi Unified School District located in Stockton, CA. Work includes:
  - 1. Removal of existing HVAC units at Buildings A and B, including all electrical and gas connections.
  - 2. Installation of new HVAC units.
  - 3. New platforms for condensing units, including roofing and waterproofing.
  - 4. Controls as shown.
  - 5. Other work as shown in the documents and as required for a complete an operational project.

**1.3 WORK BY OTHERS**

- A. Work on the Project which will be executed prior to start of Work of this Contract, and which is excluded from this Contract, is as follows:
  - 1. Owner will remove furniture, supplies, drapes and salvageable items. Owner will not remove finishes or expose structure in support of Contractor's work.
- B. Work in the Project which will be executed after completion of Work of this Contract, and which is excluded from this Contract, as follows:
  - 1. None
- C. Work on this Project which will be executed during the Work of this Contract which the Contractor shall coordinate with and facilitate:
  - 1. None

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**1.4 DIMENSIONAL TOLERANCES FOR ACCESSIBILITY**

- A. While it is recognized that construction practices generally permit a level of reasonable dimensional tolerance, the installation of any items subject to compliance with the Americans with Disabilities Act Accessibility Guidelines and Chapter 11B of the California Building Code (CBC), which are not shown with dimensional tolerances, on the drawings or in the CBC, shall be considered absolute. These dimensions will be strictly enforced. Items found to be out of tolerance may require modification and/or replacement at contractor's expense.

**1.5 CONTRACTOR'S USE OF PREMISES**

- A. Specific roads for access to and from building sites will be agreed on with the Owner. All traffic and materials delivery shall be confined to these roads.
- B. Specific areas for storage of materials and site fabrication will be agreed upon. Contractor's activities shall be confined to these areas.
- C. Work shall proceed in such manner as to not interfere with Owner's activities in and about nearby facilities. Exceptions will be made only after previous agreement between Owner, Architect and Contractor.
- D. Fire alarm, intercom, intrusion alarm and other such tests shall be conducted outside of school hours and shall be coordinated with site personnel, if such tests occur after occupancy.

**1.6 WORK SEQUENCE**

- A. Schedule and construct work in stages to accommodate Owner's use of the premises before and after the primary construction period. Coordinate the construction schedule and operations with the Owner's representative. The three stages of the construction process following the bid award shall be:
  - 1. Pre-construction Stage: Pre-construction activities shall occur from the start date, to the first day of availability. Activities shall include, but are not limited to:
    - a. Project scheduling/subcontractor coordination
    - b. Identification of long lead materials and equipment
    - c. Temporary facilities and controls
    - d. Action submittals as specified, including:
      - 1) Shop drawing submittals
    - e. Material ordering (particularly long lead items)
    - f. Material stock piling
    - g. Field measuring
    - h. The architect and engineers will expedite all long lead item submittals as quickly as possible. Such items must be indicated as "critical" when submitted. Substitutions of finishes, materials and equipment will not be permitted due to the lack of availability unless submittals are made early and completely.

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2. Construction Stage: Primary construction activities shall occur from the date of availability, through the Date of Substantial Completion. Activities shall include work as described by the construction documents.
    - a. It is the intention of the owner to make these buildings available on the dates indicated below. Certain units also may be available earlier than the dates shown.
    - b. Due to the nature of the work and the type of facilities, the schedule is fixed and cannot be altered. The premises will not be available prior to date of availability. All primary work must be completed prior to Date of Substantial Completion. Critical work, includes life safety, HVAC, plumbing, electrical service, security and general construction. Temporary measures will be required if primary work is uncompleted at start of school date.
    - c. As the Owner needs time for preparing classrooms for the new school session, the Contractor shall turn over spaces in an orderly sequence to allow occupancy and use of the spaces over the final 2 weeks of the construction period. This schedule must be prepared with the Owner's input.
  3. Completion/Close-out Stage: Completion and close-out activities shall occur from Date of Substantial Completion to Final Completion. Activities shall include:
    - a. Completion of minor finish work. Minor work shall be considered completion or installation of items which will not interfere or hinder the Owner from utilizing the facility, such as touch-up painting, hardware adjustment, etc.
    - b. Punch list work.
    - c. Project close-out.
    - d. All work performed during this period must occur outside of normal school hours. Arrangements must be made with the owner representative and work schedules approved.
- B. Delays:
1. Minor delays: Minor delays caused by parties other than the Contractor, such as the Owner or Architect will not be considered critical path delays and will not result in a time extension to the project schedule. Minor delays shall be defined as delays due to the need for review, clarifications, consideration, detailing, etc. which typically do not last more than 48 hours, are addressed promptly and solved without significant changes to the work, as determined solely by the Architect. Such items which may cause delay must be identified by the Contractor at the time of origin.
  2. Other delays: Other delays caused by unknown or unforeseen conditions or significant changes or modifications requested by or required by the Owner, Architect or DSA, will be permitted only if promptly submitted, reviewed and approved by the Architect and Owner. Such delays may result in time extensions to specific work or areas of work only, and not to other unaffected portions of the project. Such delays must directly affect the critical path of the work, be shown as unavoidable and be unable to be made up through rescheduling.
- C. Occupancy: The project will be occupied by the School Staff as shown below. Dates are fixed and cannot be changed. The premises will be occupied whether or not the work is completed regardless of time extensions (if any). Any work performed after this

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date will need to be fully coordinated with the Owner and will be limited to after school hours or weekends.

**D. Project Schedule:**

1. The following schedule summarizes the major activity dates (Dates are approximate and actual start dates are subject to change):

a.	Bid	Dates
	1) Advertise to Bid (first)	October 10, 2023
	2) Advertise to Bid (second)	October 17, 2023
	3) Pre-Bid Conference	October 19, 2023
	4) Addendum (last)	October 26, 2023
	5) Bids Due	October 30, 2023
	6) Board Award	November 7, 2023
b.	Contracts	
	1) Bond Preparation	November 8 - 15, 2023
	2) Contract Execution	November 16, 2023
c.	Pre-Construction Activities	
	1) Start Date	November 20, 2023
	2) Submittals and Approvals	Nov 20, 2023 - Jan 20, 2024
	3) Materials Ordering/Stockpiling	December 2023 - May 2024
	4) School Concludes for Summer	May 31, 2024
d.	Construction	
	1) Date of facility availability	June 1, 2024
	2) Construction, All Units	June 1, 2024 - July 23, 2024
	3) Begin turning over spaces to District	July 17, 2024
e.	Occupancy: In order to accommodate a phased occupancy by the Owner, the Contractor will turn the buildings over for occupancy as follows:	
	1) Occupancy - Staff	July 24, 2024
	2) Occupancy - Students	August 1, 2024
f.	Completion/Close-out	
	1) Substantial Completion Date	July 17, 2024
	2) Complete Minor Finish Work	July 31, 2024
	3) Complete Punch List Work	July 31, 2024
	4) Closeout/Completion	August 31, 2024

**1.7 OWNER OCCUPANCY**

- A. Owner will occupy nearby premises during construction.
- B. Refer to General Conditions for requirements for partial occupancy by Owner.
- C. Owner will not occupy buildings included in this scope of work during the primary construction period. However, occupancy will occur as shown above.

- D. Owner may occupy other buildings on premises during construction and may be present on site during summer construction period.

## **1.8 EXISTING UTILITIES**

- A. It is recognized by the District and the Contractor that the location of existing utility facilities as shown on contract drawings and specifications are approximate; their exact location is unknown.
- B. Recognition is given to the fact there may be additional utilities existing on the property unknown to either party to the Contract. Location of utilities as shown on drawings and specifications represent the best information obtainable from utility maps and other information furnished by the various agencies involved. The Owner warrants neither the accuracy nor the extent of actual installations as shown on the drawings and specifications.
- C. Because of this uncertainty, it may become necessary for the Architect to make adjustments in the line or grade of sewers or storm drains. Installation of such adjusted lines shall be made at the regular unit price bid for the work, and no additional compensation will be paid therefore, unless the scope and character of the work has been changed.
- D. The Contractor agrees and is required to coordinate and fully cooperate with the Owner and utility owners for the location, relocation, and protection of utilities. The Contractor's attention is directed to the existence of utilities, underground and overhead, necessary for all buildings within the area of work. Prior to start of trenching operations, the Contractor shall meet with Owner Representative(s) to fully review known utility locations which may affect the work.
- E. In accordance with Section 4215 of the Government Code of the State of California, the Owner shall make provisions to compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, and removing or relocating such main and trunk line utility facilities not indicated in the plans and specifications with reasonable accuracy, and for equipment on the project necessarily idled during such work. Compensation will be in accordance with the provisions of these specifications providing for change orders. Nor shall the Contractor be assessed liquidated damages for delay in completion of the project, when such delay was caused by the failure of the Owner or owner of the utility to provide for removal or relocation of such utility facilities.
- F. Nothing herein shall be deemed to require compensation to the Contractor or to relieve him from being assessed liquidated damages for such delay when the presence of unidentifiable utilities can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of construction, and the damage to existing utilities or delay was caused in whole or in part by a failure of the Owner to indicate the presence of such service laterals or appurtenances.
- G. In the event the Contractor discovers utilities not identified in the Contract plans or specifications, the Contractor shall immediately notify the Architect and the utility owner by the most expeditious means available and later confirm in writing.

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- H. Existing building utilities shall not be interrupted during normal operating hours.

**1.9 HAZARDOUS MATERIALS**

- A. Prior to start of work, the Contractor shall obtain and review the Owner's hazardous materials report on any existing facilities to become familiar with existing conditions.
- B. If asbestos or hazardous materials identified in the report are not fully addressed in the contract documents, the contractor shall bring this to the attention of the Architect prior to start of construction for clarification.
- C. Should asbestos or hazardous materials outside of the scope of work be discovered during construction operations, the contractor shall immediately notify the Project Inspector and Architect and shall suspend work in the area until necessary identification, testing and abatement (if required) is completed.

**END OF SECTION**

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**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pre-construction Meeting.
  - 2. Regular project meetings.
  - 3. Pre-installation meetings.

**1.2 GENERAL**

- A. The Architect shall make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to the Owner, Project Inspector, Contractor, participants, and others affected by the decisions made.
- B. Attendance required: Project Superintendent, Project Manager (if any), major Subcontractors (as requested), Architect, Project Inspector, and others as appropriate to the meeting topics.

**1.3 PRE-CONSTRUCTION MEETING**

- A. Upon issuing a notice of intent to award the contract, the Architect will schedule a pre-construction meeting.
- B. Agenda: Architect and Contractor shall prepare an agenda and distribute copies at least one week in advance of the Pre-Construction meeting.
- C. Architect's agenda may include, but not limited to, discussion of the following items:
  - 1. Project description and scope of work.
  - 2. Accepted alternates.
  - 3. Temporary facilities and use of the site.
  - 4. Environmental procedures.
  - 5. Hazardous materials and abatement
  - 6. Legal and code requirements.
  - 7. Designation of personnel representing the parties to the contract; lines of communication.
  - 8. Communication and responsibilities.
  - 9. Submittal procedures in accordance with Section 01 3300.
  - 10. Construction schedule and critical path.
  - 11. Schedule of values.
  - 12. Record drawings.
  - 13. Progress payments.
  - 14. Change orders and time extensions (related to critical path).
  - 15. Inspection and testing.

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16. Project closeout.

**1.4 PROJECT MEETINGS**

- A. The Architect will schedule and run weekly or bi-weekly project meetings throughout the project to review the short-term project schedule and to discuss issues requiring resolution. It is the duty of the Contractor to attend, participate in, and comply with the agreements reached and direction set at these meetings.

**1.5 MONTHLY MEETINGS**

- A. The Architect shall schedule and run monthly meetings for the purpose of assessing progress, approving payment, resolving problems, and addressing mid-range and long-range scheduling issues.

**1.6 PRE-INSTALLATION MEETINGS**

- A. The Contractor shall schedule and run pre-installation meetings in accordance with the product specifications.

**1.7 SPECIAL MEETINGS**

- A. The Architect may occasionally schedule special meetings for the purpose of discussing work requiring a significant coordination effort or for resolving issues which require more attention than they can be given in the regularly scheduled meetings. The Contractor shall attend these meetings along with representatives of subcontractors, suppliers, and/or manufacturers when appropriate for the subject matter to be discussed.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

**A. Section Includes:**

1. Requirements for the following:
  - a. Electronic Data Transfer.
  - b. Substitutions: Specific procedures for submission and approval of products other than those specified or noted on the Drawings.
  - c. Procedures for processing of Contractors "Requests for Interpretation" (RFI) questions.
2. Procedures to be followed in preparing and submitting the following:
  - a. Subcontractor List.
  - b. Progress Schedule.
  - c. Schedule of Values.
  - d. Shop Drawings.
  - e. Product Data/Material Lists.
  - f. Samples.
  - g. Requests for Information (RFI).
  - h. Record Drawings.
  - i. Certifications including those required for material VOC content.
  - j. Maintenance/Operating Manuals.
  - k. Warranties and Extended Guarantees.
  - l. Extra Stock.
3. Substitution Procedures: Specific requirements for submission and approval of products other than those specified or noted on the Drawings.
4. Procedures for processing of Contractors "Requests for Interpretation" (RFI) questions.
5. Electronic Data Transfer.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions; "Accessory Material VOC Content Certification Form."
- B. Section 01 7700, Closeout Procedures.
- C. Section 01 7836, Warranties; guarantee/warranty forms.
- D. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.
- E. Test reports: Pertinent Specification Sections (by testing lab).

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- F. Individual requirements for submittals also are described in other Sections of these Specifications.

**1.3 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples indicated in individual Specification Sections as informational submittals that do not require Architect's responsive action.
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. General;
  - 1. Shop drawings, product data, and samples are in no case to be considered Contract Documents but are to be treated only as instruments of convenience and facility to further the progress of the Work.
  - 2. Miscellaneous systems not specifically specified but installed to meet code requirements or for other reasons are subject to Architect's review prior to installation.
- B. Shop drawings, product data, samples and supporting data shall be prepared by Contractor or its suppliers but shall be submitted to Architect by Contractor as the instruments of the Contractor.
- C. Coordination of Submittals:
  - 1. Before submitting a shop drawing or any related material to Architect, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, which are the sole responsibility of the Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. By affixing the Contractor's signature to each submittal, the Contractor certifies that this coordination has been performed.
  - 2. Architect shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Architect otherwise via a written instrument which is acknowledged by the Architect in writing.
- D. Grouping of Submittals:
  - 1. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.

2. Partial submittals may be rejected as not complying with the provisions of the Contract. The Contractor may be held liable for delays so occasioned.
- E. Architect will check submittals for conformance with design concepts of project. Approval by Architect covers only such conformance. Effort will be made by Architect to discover any errors, but responsibility for accuracy and correctness of submittals shall be with the Contractor.
- F. Approval of submittals will be on a general basis only and shall not relieve the Contractor from their responsibility for proper fitting and construction of the Work, nor from furnishing materials and labor required by the Contract which may not be indicated on the submittals when approved.
- G. No portion of the work requiring submittals shall be commenced until the submittal for that portion of the work has been approved by Architect. All such portions of work shall be in accordance with the approved submittals. Any work performed without approved submittals will be done so at the Contractor's own risk. Work found not to be in compliance with the approved submittals shall be removed and corrected at the Contractor's own expense.
- H. The Contractor shall make corrections required by Architect and shall resubmit as required by Architect the required number of corrected copies of shop drawings, product data, or new samples until approved. Contractor shall direct specific attention in writing or on resubmittals to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than two (2) re-reviews of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor.

## **1.5 ELECTRONIC DATA TRANSFER**

- A. Requests for Electronic Data will be considered upon receipt of written request by the Contractor accompanied by a signed copy of the Electronic Data Request Form (included with this section). Request should clearly outline specific Drawings desired and the intent of the request.
  1. Submit Electronic Data Request Form on standard form.
  2. Allow 72 hours minimum for review and consideration by Architect.
- B. Electronic data files are not a part of the contract documents, but rather a convenience for the Contractor in preparation of his required submittals and layout efforts. Electronic files do not alter the content or meaning of the hard copy documents which may be a part of the Contract Documents.
- C. The electronic data files will remain the property of the Architect, shall not be used for any other purpose than that purpose stated in the Electronic Data Request Form, and shall not be released by the Contractor or any subcontractor to any other party without written consent from the Architect.
- D. The electronic data files are distributed for reference only. Transferring such files can alter, delete or change original information. Accuracy of the data cannot be guaranteed

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as correct or complete and the Contractor accepts full responsibility for inaccuracies, regardless of cause.

- E. The hard copy documents, including addenda and subsequent written changes to the documents, represent the complete work of the Contract. Electronic files should be cross-referenced to the Contract Documents by the user and verified from that the information included contains the necessary Contract information. It is the Contractor's responsibility to make any changes or revisions to the electronic data files as necessary.
- F. Architect may, at his complete discretion and without explanation, approve or deny requests for electronic data.

**1.6 SUBSTITUTIONS**

- A. Architect's Approval Required:
  - 1. Contract is based on materials, equipment and methods described in Contract Documents. Substitutions will not be reviewed and approved prior to the award of the contract.
  - 2. Architect will consider proposals during the submittal process for substitution of materials, equipment and methods only when such proposals are accompanied by full and complete technical data and other information required by Architect to evaluate proposed substitution. Substitution shall be submitted with completed Substitution Request Form, included with this section.
  - 3. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this work by Architect.
- B. "Or Equal": Whenever, in Contract Documents, any material, process or specified patent or proprietary name and/or by name of manufacturer is indicated, such name shall be deemed to be used for purpose of facilitating description of material and/or process desired, and shall be deemed to be followed by the words "or equal" and Contractor may offer any material or process which shall be equal in every respect to that so indicated or specified; provided, however, that if material, process or article offered by Contractor is not, in opinion of Architect, equal in every respect to that specified, then Contractor shall furnish material, process or article specified or one that in opinion of Architect is equal thereof in every respect.
- C. "No Substitutions": Items indicated as "No Substitutions" shall be provided as specified and no alternates will be allowed. These items are required either due to standards implemented by the Owner or to match materials recently installed by others.
- D. Coordination: Approval of substitution shall not relieve Contractor from responsibility for compliance with requirements of Drawings and Project Manual, and Contractor shall be responsible at his own expense for any changes in other parts of its own work or work of others which may be caused by approved substitution.
- E. DSA Approval: Substitutions of certain items may cause such items to require a Deferred Approval by DSA. Should a DSA Deferred Approval be required, the Contractor shall provide information and documents necessary to complete the Deferred Approval process without any additional costs to the Owner, including engineering, calculation and modification of substitute products.

## **PART 2 - SUBMITTALS**

### **2.1 SUBCONTRACTOR LIST**

- A. Provide a typed list of Subcontractors within 5 days of notice of the award of contract. Include Subcontractor name, address, phone number, license number and trade.

### **2.2 PROGRESS SCHEDULE**

- A. Prepare and submit estimated progress schedule for work within 10 calendar days after issuance of Notice to Proceed. Submit up-dated schedules:
  - 1. At mid-point of construction.
  - 2. When time extensions of more than two weeks are necessary.
- B. Relate progress Schedule to entire Project. Indicate following:
  - 1. Dates for starting and completion of various sub-contracts.
  - 2. Dates for submission of required submittals.

### **2.3 SCHEDULE OF VALUES**

- A. Before first Application for Payment, submit for Architect's approval a Schedule of Values of various portions of work, aggregating total Contract sum, divided so as to facilitate payment to subcontractors, prepared in such form as Architect and Contractor may agree upon, and supported by such data to substantiate its correctness as Architect may require.
  - 1. Breakdown shall include separation of sitework from building work for main categories including electrical, plumbing, concrete, etc. Separations shall also be provided for each building of a multiple building contract. Include proper share of overhead and profit with each item in Schedule of Values.
  - 2. This Schedule, when approved by Architect, shall be used as basis for Contractor's applications for payment. Payment will not be released until a Schedule of Values is accepted.
- B. Schedule of Values shall appear similar to the following list and generally following the Table of Contents of this Project Manual as the format for listing component items. It shall be detailed at least as shown and portions shall not be more largely grouped so as to reduce its length unless appropriate to the scope of the Work. Mobilization/Start-up is limited to 2 percent on contracts greater than \$1,000,000 and 4 percent on contracts less than \$1,000,000. Contract closeout to be a minimum of 2 percent.
  - 1. Mobilization/Start-up.
  - 2. Temporary Facilities.
  - 3. Structural Steel/Metals.
  - 4. Lumber.
  - 5. Roofing.
  - 6. Roof Hatches.

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7. Caulking and Sealants.
8. HVAC/Sheet Metal.
9. Electrical – Building.
10. Labor/Supervision.
11. Cleanup.
12. Contract Closeout.

**2.4 SUBMITTAL SCHEDULE**

- A. Contractor shall prepare and submit to Architect a "Submittal Schedule" when required by the General Conditions showing scheduled dates of submittals and date required for return of submittals to Contractor.
- B. Contractor shall provide in Schedule the minimum specified working days for Architect to review and check submittals provided it is not a deferred approval item. Based on the number and complexity of submittals at any one time, Architect's review period may be longer than the days specified.
- C. Dates on "Submittal Schedule" shall be agreed upon by both Architect and Contractor.

**2.5 PROJECT DIRECTORY**

- A. After execution of the Contract but prior to commencement of Work, Contractor shall submit to Architect a Project Directory listing subcontractors and vendors on the Project and giving a brief description of their scope of work, firm name, contact person, address, phone number, e-mail address, and fax number if used.

**2.6 SHOP DRAWINGS**

- A. Submit shop drawings as a copy of the original set maintained by the Contractor. Shop drawings are to include the name of the project, the name of Contractor and are to be numbered consecutively. Provide legible and complete copies in every respect. Provide quantity as described below. Do not reproduce the Contract Drawings in lieu of Contractor or subcontractor produced shop drawings.
- B. If shop drawings show variations from Contract requirements because of standard shop practice or other reason, make specific mention of such variations in letter of transmittal, as well as on Drawings, in order that (if acceptable) suitable action may be taken for proper adjustment of the Contract Documents. Unless specific changes have been noted and approved, no deviations from Contract Documents will be accepted.

**2.7 PRODUCT DATA / MATERIAL LISTS**

- A. Manufacturer's Standard Schematic Drawings:
  1. Modify Manufacturer's drawings to delete information which is not applicable to the Project.
  2. Supplement standard information to provide additional information which is applicable to the Project.



- B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
  - 1. Clearly mark each copy to identify pertinent materials, products or models. Mark out or remove extraneous information.
  - 2. Show dimensions and clearances required.
  - 3. Show performance characteristics and capacities.
  - 4. Show wiring diagrams and controls.

## **2.8 SAMPLES**

- A. Samples: Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
  - 1. Include identification on samples including product and material and location of proposed work.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of product or material, with integrally related parts and attachment devices.
  - 2. After review, samples may be used in construction of project.
- C. Field samples and mockups:
  - 1. Erect at project site at location acceptable to Architect.
  - 2. Construct each sample or mockup complete, including work of trades required in finished work.

## **2.9 REQUESTS FOR INFORMATION (RFI)**

- A. Requests for additional information (RFI's) beyond that set-forth in the Contract Documents will be considered when the request is in writing and fully documented. Requests shall state the source and reason for the request; identify specific references within the Contract Documents pertinent to the request; and supply supporting information to assist the Architect in his/her response. Verbal responses to such requests are to be considered informational; official response will only be given in writing.
  - 1. Submit RFI's on standard form, included with this Section, and numbered consecutively.
  - 2. Allow a minimum of 72-hours for review by Architect. Additional time may be required for more complex issues.
  - 3. Provide suggested solution on standard RFI form where indicated.
  - 4. Provide detailed cost estimate for RFI's that are anticipated to exceed \$500 in extra costs to the Owner.
- B. Because RFI's are used for clarification or Construction Document interpretation purposes, the response will be issued back to the Contractor in the space provided on the standard RFI form. More complex issues requiring Contract Document revisions and/or which may result in a change in cost to the Contract will be handled using a

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Construction Change Document (CCD). RFI's and CCD's will not be used to address simple or minor coordination or construction issues which can normally be addressed quickly and easily by the Contractor or in conjunction with the Contractor and Architect. RFI's deemed unnecessary or frivolous by the Architect will be returned to the Contractor for reconsideration or will be rejected. RFI's so returned shall be removed from the RFI log and noted as unnecessary.

**2.10 CERTIFICATIONS**

- A. Where specifically indicated by pertinent Specification Sections, submit proper certification of recognized producer or association in lieu of or in addition to testing. Certification shall attest to product's compliance with requirements of Contract Documents.
- B. Certifications for this project shall also include:
  - 1. Fire Alarm System Certification:
    - a. As specified in Division 28.
  - 2. Megger Grounding Test Certificate:
    - a. Submit completed Megger Grounding Test Certificate (included with this section) with Testing Agency reports attached, as specified in Division 26.
  - 3. Certificate of Compliance for Building Materials:
    - a. Submit completed Certification of Compliance for Building Materials (included with this section).

**2.11 MAINTENANCE / OPERATION MANUALS**

- A. General: Contractor shall incorporate in Maintenance/Operation Manual(s) brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance. These items include carpets, resilient flooring, architectural finishes, mechanical and electrical equipment and other items as required elsewhere in Contract Documents. Prepare manuals in durable plastic loose leaf binders sized to accommodate 8-1/2 x 11 sheets with following minimum information:
  - 1. Identification on or readable through, front cover stating general nature of manual.
  - 2. Neatly typewritten index of contents.
  - 3. Site plan and building plans indicating location of equipment referenced (reduced scale).
  - 4. Complete instructions regarding operation and maintenance of equipment involved.
  - 5. Complete nomenclature of replaceable parts, their part numbers, current cost and name and address of nearest vendor of parts.
  - 6. Copy of warranties issued, in a separate binder as specified in this Section.
  - 7. Copy of approved shop drawings (reduced scale) with data concerning changes made during construction.
- B. Extraneous Data:

1. Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in the Project installation and delete, or otherwise clearly indicate, manufacturer's data with which the Project installation is not concerned.
- C. Materials shall be organized in a logical and consistent manner, by Specification Section number, with separating tabs clearly marked.
- D. When submitting electronic file via Newforma, materials shall be organized in order ascending by Specification Section number and including clear separation within one pdf file, following format prescribed in paragraphs A and B of this Article.

## **2.12 WARRANTIES AND GUARANTEES**

### **A. Contractor Standard Guarantee:**

1. Furnish Owner with its Standard Guarantee for work executed under this Contract, including approved extra work, to be absolutely free of defects of workmanship and materials for a period of two (2) years from the date of filing of the Notice of Completion.
2. Under the terms of its warranty, Contractor shall guarantee to repair and make good defects and repair damage to other work caused thereby which may occur during the Warranty period at no cost to the Owner.
3. Guarantees and warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect the Guarantee and Warranty between Contractor and Owner.
4. Contractor's Standard Guarantee shall be submitted on the Guarantee/Warranty form included in Section 01 7836, Warranties.

### **B. Subcontractor Standard Guarantee:**

1. Contractor shall countersign and furnish Owner with a Subcontractor Standard Guarantee from each Subcontractor for their work executed under this Contract, and approved extra work, to be free of defects of workmanship and materials for a period equal to the Contractor Standard Guarantee.
2. Under the terms of its warranty, Subcontractor shall guarantee to repair and make good defects and repair damage to other work caused thereby which may occur during the Warranty period at no cost to the Owner.
3. Subcontractors individual Standard Guarantee shall be submitted on Guarantee/Warranty form included in Section 01 7836, Warranties.

### **C. Special or Extended Guarantee/Warranty:**

1. In addition to the Contractor's and Subcontractor's Standard Guarantees, furnish Owner with special or extended warranties in excess of the Standard Warranty term of the Contract where specified in the respective Sections of the Specifications.
2. Where special or extended guarantees are related to work of a Subcontractor, the written Guarantee/Warranty form prepared by the Contractor shall be co-signed by the respective responsible subcontractor and a separate and addition

## **SUBMITTAL PROCEDURES**

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Guarantee/Warranty form shall be prepared by the Subcontractor and co-signed by the Contractor.

3. Each Special or Extended Guarantee/Warranty shall be submitted on the forms included in Section 01 7836, Warranties.
- D. Provide a binder with the executed Guarantee/Warranty forms placed in the order in which they occur in the Project Manual. Include an Index listing each Specification Section, specific items covered and length of warranty for each item.
- E. When submitting electronic file via Newforma, materials shall be organized in order ascending by Specification Section number and including clear separation within one pdf file.

## **2.13 RECORD DRAWINGS AND SPECIFICATIONS**

- A. The Contractor shall prepare and maintain on a current basis an accurate and complete set of Record Drawings and Annotated Specifications showing clearly the following:
  1. Changes, revisions, and substitutions during construction, including, without limitation, field changes.
  2. Addenda, Construction Change Documents and Clarifications issued by the Architect.
  3. The final location of mechanical equipment, ducts, outlets, structural members, walls, partitions, and other significant features. Note both vertical and horizontal dimensions of concealed installations.
  4. Installed locations of underground work and utilities, including storm drain piping, plumbing, electrical and stubs for future connections. Note both vertical and horizontal locations of underground facilities from permanent monuments such as building corners or other permanent structures, and finish grades.
  5. In the event of a specification that allows Contractor to elect one of several brands, makes, or types of material or equipment, the annotations shall show which of the allowable items the Contractor has furnished.
- B. The Contractor shall update the Record Drawings and Specifications as often as necessary to keep them current but no less often than weekly, and up-dated monthly, prior to and pursuant to approval of the progress payment application.
  1. Record drawings and specifications are to remain on site and available for inspection by the District Representative, Project Inspector and the Architect.
  2. Changes shall be made in an accurate and legible manner by a qualified draftsman acceptable to Architect.
  3. Symbols and designations used in preparing Record Drawings shall match those used in the Contract Drawings.
- C. At project completion, the Record Drawings and Annotated Specifications shall be submitted by the Contractor for Owner's Project Inspector and Architect review and comment.

1. These will be returned to the Contractor for revisions. Once corrections have been completed the Inspector shall sign and date the record set coversheet noting it as acceptance of the completed Record Drawings and Specifications.
2. Prior to Application for Final Payment, the original Record Drawings and Specifications are to be resubmitted to the Architect along with a scanned electronic file set in PDF format with each drawing bookmarked, matching the Drawing titles.
3. When submitting electronic file via Newforma, materials shall be organized in order ascending by Sheet Number as shown on the Drawing Sheet Index within one pdf file.

**D. Conditions of Payments:**

1. At the end of each month the Project Inspector will review the record drawings and specifications. If the records are incomplete, or incorrect, an appropriate amount of dollars, equivalent to the cost of uncovering the work to determine the locations of piping and the like, may be deducted from the next progress payment. The deducted sum will be withheld until the record drawings are updated and/or corrected.
2. Written confirmation from the District Representative that the record drawings and specifications have been properly updated weekly shall be submitted with each pay application request, and the existence of such properly updated records shall be a condition precedent to payment.
3. On completion of the Contractor's portion of the Work and prior to Application for Final Payment, the Contractor shall provide one complete set of approved Record Drawings and Specifications to the Owner, in format as specified, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work. Delays in the submission of complete record documents may subject the Contractor to liquidated damages.

**2.14 EXTRA STOCK**

- A. Provide extra stock and materials, as described in the individual Specification Sections, to the Owner at time of final acceptance.
- B. Materials shall be inventoried in writing, neatly packaged, with labels clearly identifying contents and quantities.
- C. Contractor shall obtain written acceptance of delivery from Owner.

**PART 3 - EXECUTION**

**3.1 GENERAL SUBMISSION REQUIREMENTS**

- A. This project is using Newforma Info Exchange for transmission and processing of project documentation. The Contractor is responsible for making contract submissions through this web accessed system. No supplementary software is required for use. User names and passwords will be granted at the beginning of the project.

**SUBMITTAL PROCEDURES**  
**SECTION 01 3300**  
**3431005**

- B. Contractor is responsible for the scheduling of submittals in order to avoid detrimental impact to the construction schedule and to support the timely sequence of the Work.
  - 1. Allow a minimum of 15-working days for submittal review by the Architect. Complex submittals or submittals which are not provided as complete packages may take longer than 15-working days for review.
  - 2. Contractor shall allow time for potential rejection and re-submittal of submittals which are being offered as substitution to the specified products.
- C. Contractor shall review submittals for completeness, coordination and conflicts between subcontractors and other Work in the Contract Documents.
  - 1. Subcontractors shall make submittals to Contractor.
  - 2. Submittals made by subcontractors which are not thoroughly reviewed by the Contractor will be returned. Submittals which vary significantly from the Contract Documents and are not so identified prior to submission, will be returned to the Contractor without review.
- D. Mechanical and electrical submittals, excluding underground work, shall each be packaged together so that products/components for these two major disciplines are transmitted to the Architect as a single submittal package for review.
- E. Submittals shall be accompanied by Submittal Transmittal, included at the end of this Section, addressed to the Architect. Each submittal transmittal shall:
  - 1. Be consecutively numbered.
  - 2. Re-submittals to have same submittal number as the original submittal with an alphanumeric suffix.
  - 3. Indicate Specification Section number. Separate submittals are required for each Specification Section involved.
  - 4. Include proper number of copies, as required in "Number of Copies Required" below.
  - 5. Contain index of items submitted, properly identified with Drawing numbers, etc.
  - 6. Substitutions shall be accompanied by a completed Substitution Request Form (included with the Project Manual).
- F. Electronic Submittals.
  - 1. Product data submitted electronically shall be submitted in .pdf format. Submittals shall be organized in a logical format grouping items and subsections together. The first page of each item or subsection must be bookmarked and properly labeled. If multiple fixtures or products are included in a single submittal, each item and corresponding information shall be separately grouped and bookmarked as noted above. This formatting and bookmarking shall also apply to other data submitted electronically like warranties/guarantees, maintenance & operations manuals and certifications.
  - 2. Shop drawings submitted electronically shall be submitted in .pdf format. Shop drawings shall be organized in a logical format grouping sections together (plans, elevations, details, schedules, etc.). Each sheet of the shop drawings shall be

bookmarked and properly labeled. Plan references and detail callouts shall be hyperlinked to properly jump to the referenced page or detail.

G. Number of Copies Required - Contractor shall submit following number of copies:

1. Subcontractor List: 1-electronic copy in PDF.
2. Progress Schedule: 1-electronic copy in PDF.
3. Schedule of Values: 1-electronic copy in PDF.
4. Shop Drawings: 1-electronic copy in PDF format.
5. Product Data/Material Lists: 1-electronic copy in PDF format.
6. Samples: As specifically indicated in the respective Specification Section or, if not indicated, two more than the Contractor requires to be returned.
7. Samples for Color/Pattern Selection: One set of manufacturer's complete range for initial selection; and 4 samples as requested of selected color/pattern for inclusion in final color boards.
  - a. As color selection is dependent on multiple submittals, it is critical that items requiring color decisions be submitted as early as possible and at the same time.
  - b. Selections will not be finalized until color dependent/selection submittals are received.
8. Substitution Request: 1-electronic copy in PDF.
9. Request for Information: 1-electronic copy in PDF.
10. Electronic Transfer: 1-electronic copy in PDF.
11. Certifications: 1-electronic copy in PDF.
12. Maintenance/Operations Manuals: After approved via Newforma submittal, 1-hard copy plus 1-electronic copy in format acceptable to the Owner.
13. Guarantees/Warranties: After approved via Newforma submittal, 1-hard copy, plus 1-electronic copy in format acceptable to the Owner. Refer to Section 01 7836, Warranties, for forms and additional requirements for assembly of guarantees/warranties.
14. Record Drawings: After approved via Newforma submittal, 1-hard copy plus 1-electronic copy in format acceptable to the Owner.

H. Submittals shall include the following, as applicable:

1. Date and revision dates.
2. Project title and number.
3. The names of Architect, Contractor, Subcontractor and supplier or manufacturer.
4. Identification of product or material.
5. Relation to adjacent structure or material.
6. Field dimensions, clearly identified as such.
7. Specification section number.
8. A blank space for Architect's stamp.

## **SUBMITTAL PROCEDURES**

### **SECTION 01 3300**

**3431005**

9. Contractor's stamp on each, initialed or signed, certifying that submittal was reviewed, field measurements have been verified and submittal is in compliance with the applicable Specification Section and the overall Contract Documents.

- I. Incomplete, inaccurate or non-complying submittals requiring revisions, re-submittal and additional review time, shall not be considered as a basis for Contract time extension.

### **3.2 PROCEDURES FOR ACTION SUBMITTALS**

- A. Action Submittals are identified in the respective Specification Section and shall be submitted in accordance with the specified web based access system.

- B. Number of Copies: As specified under Article "General Submission Requirements."

- C. Architect's Review:

1. General:

- a. Except for finish, color, and other aesthetic matters left to Architect's decision by Contract Documents, Architect's review is only for Contractor's convenience in following work and does not relieve Contractor from responsibility for deviations from requirements of Contract Documents.
- b. Do not construe Architect's review as a complete check or relief from responsibility for errors or omissions of any sort in shop drawings or schedules or from necessity of furnishing work required by Contract Documents that may not have been shown on shop drawings.
- c. Architect's review of a separate item does not indicate review of complete assembly in which it functions.
- d. Review comments of the Architect (or its consultants) will be shown when it is returned to the Contractor. The Contractor shall make and distribute such copies as are required for its purposes.

- D. Processing:

1. Architect will review Action Submittals in accordance with agreed upon "Submittal Schedule" and will return them to Contractor with Architect's stamp.
2. Notations by Architect which increase Contract cost or time of completion shall be brought to Architect's attention before proceeding with work. Failure to do so will result in the increased costs being borne by the Contractor.
3. Each submittal will be stamped indicating appropriate action to be taken by the Contractor.
4. If for any reason the Contractor cannot comply with the notations, Contractor shall re-submit submittal. In the transmittal letter accompanying the re-submittal, clearly describe the reason(s) for not being able to comply with the notations.

- E. Action and Distribution:

1. Architect will stamp submittals and Contractor shall comply with action noted on the Architect's "Submittal Review" stamp.



2. Unless otherwise directed for mutually agreed or required by the Architect's stamp, Architect will return submittals to the Contractor via the specified web access system.
  3. If corrections are required, the Contractor is responsible for making the necessary corrections and re-submitting the shop drawings in a timely fashion as to not affect the project schedule.
  4. The Contractor shall secure final acceptance prior to commencing work involved.
- F. Consultants' Review:
1. Submittals requiring review by Architect's or Owner's consultants shall be uploaded to the specified web access system for distribution by the Architect.
  2. Processing shall be in accordance with consultants stamp.
    - a. If action required by consultants stamp is not clear, Contractor shall immediately notify the Architect for a clarification.
    - b. If returned submittal also includes the Architect's stamp, processing shall be in accordance with the Architect's stamp.
- G. Revisions:
1. If revisions are required, the Contractor is responsible for making the necessary changes pertinent to by comments noted on the submittal and re-submitting the shop drawings in a timely fashion as to not affect the project schedule.
  2. If the Contractor considers any required revision to be a change, they shall so notify the Architect.
  3. Show each revision by number, date, and subject in a revision block on the submittal.
  4. If for any reason Contractor cannot comply with the notations, Contractor shall resubmit submittal.
- H. Revisions after Review: When a submittal has been reviewed by the Architect, resubmittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary.

### **3.3 PROCEDURES FOR INFORMATIONAL SUBMITTALS**

- A. Informational Submittals are identified in the respective Specification Section and shall be submitted in accordance with the specified web based access system.
- B. Number of Copies: As specified under Article "General Submission Requirements."
- C. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- D. Test and Inspection Reports: Comply with requirements specified in Section 01 4523, Testing and Inspection Services.

**SUBMITTAL PROCEDURES**  
**SECTION 01 3300**  
**3431005**

**3.4 PROCEDURES FOR CLOSEOUT AND MAINTENANCE MATERIAL SUBMITTALS**

- A. Closeout and maintenance material submittals are identified in the respective Specification Section and shall be submitted as specified or, if not specified, in accordance instructions provided by the Architect.
- B. Comply with the additional requirements specified in Section 01 7700, Closeout Procedures.

**3.5 FORMS**

- A. The following submittal forms are included as part of this Section.
  - 1. Submittal Transmittal.
  - 2. Substitution Request.
  - 3. Request for Information.
  - 4. Electronic Data Request.
  - 5. Megger Grounding Test Certificate.
  - 6. Certification of Compliance for Building Materials.

**END OF SECTION**

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procedures.docx  
Last Updated: June 17, 2020*

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

SUBMITTAL NO.:

Architect's Project # 3431005

DATE: \_\_\_\_\_

DSA File/Apl. # XX-XX/XX-XXXXXX

Re-Submittal of Original No.: \_\_\_\_\_

**1. SUBMITTAL TRANSMITTAL**

Attention: Jennifer Huang

Contractor: Company \_\_\_\_\_

Contact: Name \_\_\_\_\_

Sub Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_



**Please submit only one trade per submittal! Description of submitted materials:**

Quantity submitted	Specification Section		Description of contents (e.g. product data, shop drawings, samples)
	Section #	Section Title	

**Contractor Statement: (read and acknowledge)**

This submittal has been reviewed and approved with respect to the means, methods, techniques, and procedures of construction, safety precautions, and program incidentals thereto. This submittal complies with the contract documents and comprises no variations thereto, unless accompanied by a substitution request.

By: \_\_\_\_\_  
Name

Date: \_\_\_\_\_

**2. RE-TRANSMITTAL TO CONTRACTOR:**

Distribution: Contractor, Owner, Project Inspector, RGA, Other

- ☐ NO EXCEPTIONS TAKEN  
☐ SUBMIT SPECIFIED ITEM

- ☐ REJECTED  
☐ REVISE AND RESUBMIT

- ☐ FURNISH AS CORRECTED  
☐ NO ACTION REQUIRED

Corrections or comments made on the shop drawings during this review do not relieve the Contractor from compliance with requirements of the Drawings and Specifications. This general check is only for the review of conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his work with that of all the other trades, and performing his work in a safe and satisfactory manner.

**Rainforth Grau Architects**

By: \_\_\_\_\_ Date: \_\_\_\_\_

**Additional Comments:**

See Specification Section 01 3300 for use of this form

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

**SUBSTITUTION  
REQUEST NO.:**

Architect's Project # 3431005  
DSA File/Appl. # XX-XX/XX-XXXXXX

Date: \_\_\_\_\_

**1. SUBSTITUTION REQUEST**

Attention: Jennifer Huang

Contractor: Company \_\_\_\_\_

Contact: Name \_\_\_\_\_



***Please submit only one product per request!***

Sub Contractor: \_\_\_\_\_

***Include with a specified product Submittal***

Contact: \_\_\_\_\_

**2. PROPOSED SUBSTITUTIONS: The undersigned requests consideration of the following substitution:**

Specified Item: \_\_\_\_\_ Page No.: \_\_\_\_\_ Paragraph No.: \_\_\_\_\_

Proposed Item: \_\_\_\_\_

**3. REASON FOR REQUEST:**

**4. REQUIREMENTS FOR SUBSTITUTIONS:**

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified. Attached data also includes a description of changes to Contract Documents, which proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed substitution does not affect dimensions shown on drawings and does not require design changes in the Contract Documents.
2. The undersigned will pay for changes to the building design, including engineering design, detailing and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on the work, the schedule or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed substitution.

The undersigned further states that the function, appearance and quality of the proposed substitution are equivalent or superior to the specified item.

Signature - Contractor/Subcontractor \_\_\_\_\_

Date \_\_\_\_\_

**5. TRANSMITTAL TO CONTRACTOR:**

Distribution: Contractor, Owner, Project Inspector, RGA, Other

☐ **ACCEPTED**

☐ **ACCEPTED AS NOTED**

☐ **REJECTED**

**Rainforth Grau Architects**

By: \_\_\_\_\_

Date: \_\_\_\_\_

**Comments:**

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

RFI NO.:

Architect's Project # 3431005  
DSA File/Apl. # XX-XX/XX-XXXXXX

Date: \_\_\_\_\_

---

**1. REQUEST FOR INFORMATION**

Attention: Jennifer Huang

From:

Contractor:

Company \_\_\_\_\_

Contact:

Name \_\_\_\_\_

Sub Contractor:

\_\_\_\_\_

Contact:

\_\_\_\_\_



---

**Identify related specific references within the Contract Documents and supporting information:**

Dwg./Document No.: \_\_\_\_\_

Building/Site Location: \_\_\_\_\_

---

**2. Existing Condition** (source / reason for the request):

---

**3. Recommended Contractor Action(s) for resolution:**

---

**4. Project Inspector Acknowledgment:**

Date Reviewed: \_\_\_\_\_

---

**5. Owner / A/E Resolution(s):**

Date of Response: \_\_\_\_\_ By: \_\_\_\_\_

---

*Attachments:* \_\_\_\_\_

*Extra Work Involved in the Above Described Change?*

Yes ☐

No ☐

Distribution: Contractor, Owner, Project Inspector, RGA, Other  
See Specification Section 01300 for use of this form

Victor Elementary School - HVAC Replacement  
Lodi Unified School District

**E-DATA  
REQUEST NO.:**

Architect's Project # 3431005  
DSA File/Apl. # XX-XX/XX-XXXXXX

**Date:** \_\_\_\_\_

---

**1. ELECTRONIC DATA REQUEST**

Attention: Jennifer Huang

From: Contractor: Company

Contact: Name

Sub Contractor:

Contact: \_\_\_\_\_



---

**2. DATA REQUESTED - Provide list of specific drawings requested (include sheet numbers):**

---

**3. REASON FOR REQUEST - Provide clear explanation of why information is desired and for what purpose it will be utilized:**

---

**4. ACKNOWLEDGEMENT OF RESPONSIBILITY:**

The electronic data files requested are distributed for reference only. Transferring such files can alter, delete or change original information. Accuracy of the data cannot be guaranteed as correct or complete and the Contractor accepts full responsibility for any and all inaccuracies, regardless of cause.

The hard copy documents, including addenda and subsequent written changes to the documents, represent the complete work of the contract and all electronic files should be cross-referenced and verified from that information as electronic files may not contain all contract information. It is the Contractor's responsibility to make any changes or revisions necessary.

This electronic data is furnished without guarantee of compatibility with your hardware or software. It is the Contractor's responsibility to notify the Architect in the event a compatibility problem or disk defect is encountered and a replacement disk is necessary.

This electronic data, in its present form, remains the property of Rainforth Grau Architects and shall not be used for any other purpose than to provide background information for the project noted above. It is not to be released to any other party without the written consent of Rainforth Grau Architects.

Accepted by: \_\_\_\_\_  
Signature - Contractor/Subcontractor

Representing: \_\_\_\_\_  
Contractor/Subcontractor Company Name

### **MEGGER GROUNDING TEST CERTIFICATE**

This certifies that a Megger Grounding Test for the **Victor Elementary School - HVAC Replacement** for the **Lodi Unified** School District, of **San Joaquin** County, California was conducted on the \_\_\_\_\_ day of \_\_\_\_\_, **2023**, per CCR Title 24, Sections 200 H and J. The undersigned verifies that the resistance to ground was 25 ohms or less, as required, and is found to be acceptable.

Project Name: \_\_\_\_\_

DSA File No.: \_\_\_\_\_ DSA Application No.: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

General Contractor's Signature: \_\_\_\_\_

Electrical Contractor's Signature: \_\_\_\_\_

Testing Agency's Signature: \_\_\_\_\_

District Inspector's Signature: \_\_\_\_\_

**SEPARATE CERTIFICATE IS REQUIRED FOR EACH SITE**

### **CERTIFICATION OF COMPLIANCE FOR BUILDING MATERIALS**

This is to certify, in accordance with the Environmental Protection Agency requirements, that the materials and equipment used in the construction of the **Victor Elementary School - HVAC Replacement** for the **Lodi Unified** School District of **San Joaquin** County, California, are asbestos free and are, therefore, not subject to monitoring for asbestos contamination.

Project Name: \_\_\_\_\_

Address: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**SEPARATE CERTIFICATE IS REQUIRED FOR EACH SITE**



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Alteration requirements for modernizations, remodels, and additions.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 1100, Summary of Work.
- B. Section 01 7329, Cutting and Patching.

### **1.3 REFERENCES AND STANDARDS**

- A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Contractor to coordinate and conduct a meeting with the demolition contractor to verify which systems, if any, are to be protected and maintained. Such systems shall be clearly identified and marked to avoid unnecessary damage or removal.
  - 2. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate Owner occupancy.

### **1.5 QUALITY ASSURANCE**

- A. Manufacturer and Installer Qualifications: As specified in the product specifications.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. Single Source Responsibility: Use materials and products of one manufacturer whenever possible.
- D. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Inspector of Record. Work not so inspected is subject to uncovering and replacement.

### **1.6 FIELD CONDITIONS**

- A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

**ALTERATION PROJECT PROCEDURES**  
**SECTION 01 3516**  
**3431005**

**PART 2 - PRODUCTS**

**2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK**

- A. New Materials: As specified in product Sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspection and testing products where necessary, referring to existing work as a standard.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Verify that demolition is complete and areas are ready for installation of new work.
- B. Inspect conditions of uncovered work affecting installation of products or performance work.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. Beginning of restoration work means acceptance of existing conditions.
- E. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

**3.2 PREPARATION**

- A. Close openings in exterior surfaces to protect existing work and salvage items for weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.
- B. Cut, move or remove items as necessary for access to alterations and renovation work.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete.
- E. Prepare surface, and remove surface finishes to provide for proper installation of new work and finishes including blocking, framing, insulation, etc.
- F. Replace materials as specified for finished work.

**3.3 INSTALLATION**

- A. Complete Project in all respects including operational mechanical and electrical work.
- B. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition, and installation of concealed work, as specified in Section 01 7329, Cutting and Patching,

- C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- D. Install products as specified in individual specifications Sections.
- E. Where materials or equipment are removed, but no new finish is scheduled, patch and repair any damage to match existing wall surface.

### **3.4 TRANSITIONS**

- A. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work is to match existing adjacent work in texture and appearance.
- B. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural point of division and make recommendation to Architect.

### **3.5 ADJUSTMENTS**

- A. Where a change of plane of 1/8" or more occurs, submit recommendation for providing a smooth transition for Architect review.
- B. Fit work at penetrations of surfaces as specified in Section 01 7329.

### **3.6 FINISHES**

- A. Finish surfaces as specified in individual Product Sections.
- B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

### **3.7 REPAIR OF DAMAGED SURFACES**

- A. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- B. Repair substrate prior to patching finish.
- C. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

### **3.8 CLEANING**

- A. Upon completion of installation, remove manufacturer's temporary labels and marks of identification. Thoroughly clean surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition.

### **3.9 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

**ALTERATION PROJECT PROCEDURES**  
**SECTION 01 3516**  
**3431005**

- B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

**END OF SECTION**

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procedures.docx  
Last Updated: December 16, 2021*

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Special environmental, sustainable, and “green” building practices related to indoor air quality, resource efficiency supplementing the Pollutant Control requirements specified under Section 01 8113.10, Sustainable Design Requirements, and to ensure healthy indoor air quality in final Project.
- B. Contractor is required to comply with sustainable building practices during construction and when considering materials for substitutions. Refer to Article “Design Requirements.”

**1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions.
- B. Section 01 7419, Construction Waste Management and Disposal.
- C. Section 01 8113, Sustainable Design Requirements.
- D. Division 23, Mechanical General Conditions.
- E. Division 23, Packaged Air Conditioning Units.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Sustainable Design Submittals shall comply with the additional requirement of Section 01 8113, Sustainable Design Requirements.
  - 3. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

**1.4 DESIGN REQUIREMENTS**

- A. Owner has established general environmental goals for design and for construction of the Project.
  - 1. In addition to the Contractor, the Contractor’s construction team, including subcontractors, suppliers, and manufacturers, are encouraged to participate where possible to realize the Owner’s environmental goals.
  - 2. Intent is for environmental goals to be achieved in a manner which ultimately provides a safe and healthy environment for building occupants with minimal impact on the local, regional and global environment.
- B. Environmental Goals:

## **ENVIRONMENTAL PROCEDURES**

### **SECTION 01 3543**

**3431005**

1. Refer to specific Specifications Sections for more detailed construction requirements related to specific materials and systems.

#### **1.5 INFORMATIONAL SUBMITTALS**

##### **A. Indoor Air Quality (IAQ) Data:**

1. Environmental Issues: Submit emission test data produced by acceptable testing laboratory, listed in this Specification Article "Quality Assurance," for materials as required in each specific Specification Section.
  - a. Laboratory reports shall contain emissions test data on Volatile Organic Compounds (VOCs) including Total Volatile Organic Compounds (TVOC), specific individual VOCs, formaldehyde and other aldehydes as described in this Section.
  - b. Identify VOCs emitted by each material as required in these Specifications, and demonstrate compliance with the California Green Building Standards Code, edition current as of the date of this Contract.
  - c. Specific test conditions and requirements are set forth in the Specifications. For required tests, submit documentation of sample acquisition, handling, and test specimen preparation, as well as test conditions, methods, and procedures. The tests consist of a 10-day conditioning period followed by a 96-hour test period.
    - 1) Samples collected during the test period at 24, 48, and 96-hours shall be analyzed for TVOC and formaldehyde.
    - 2) VOC samples collected at 96 hours shall be identified and quantified for compounds that are found on the list of Chemicals of Concern. The Chemicals of Concern list is based on the California OEHHA list as of September 2002 (The most recent list shall be used for this Specification as published at:
      - a) [http://www.oehha.org/air/chronic\\_rels/allChrels.html](http://www.oehha.org/air/chronic_rels/allChrels.html).
2. Cleaning and Maintenance Products: Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products. These procedures are for final Contractor cleaning of the project prior to Substantial Completion and for provided materials and products as required by the specific Specification Sections.
  - a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1 percent of the total mass of the cleaning product is a carcinogen or reproductive toxicant as identified in the Chemicals of Concern list referenced above.
  - b. Avoid cleaning products containing alpha-pinene, d-limonene or other unsaturated carbon double bond alkenes due to chemical reactions with ozone to form aldehydes, acidic aerosols, and ultra-fine particulate matter in indoor air.

##### **B. Certificates:**

1. Prior to Final Completion, submit a certificate signed by corporate office holder of Contractor, subcontractor, supplier, vendor, installer or manufacturer primarily responsible for the manufacturing of the product, indicating materials provided are essentially the same, and contain essentially the same components as products and materials tested.
2. Comply with requirements specified in Specification Section 01 7700, Closeout Procedures.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Submit data relating to Environmental Issues.
  1. Submit environmental product certifications, in two forms:
    - a. Two CD-ROMs organized by CSI Division Format.
    - b. Three three-ring binders organized by CSI Division Format with Table of Contents and with dividers for each Division.

## **1.7 QUALITY ASSURANCE**

- A. Environmental Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for environmental issues compliance and coordination.
  1. Experience: Environmental project manager shall have experience relating to sustainable building construction.
  2. Responsibilities: Carefully review the Contract Documents for environmental issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
  3. Meetings: Discuss Environmental Goals at following meetings.
    - a. Pre-construction meeting.
    - b. Pre-installation meetings.
    - c. Regularly scheduled job-site meetings.
    - d. Special sustainability issues meetings.
- B. Environmental Issues Criteria: Comply with requirements listed in the Specification Sections.
- C. Acceptable Indoor Air Emissions Testing Laboratories:
  1. Selection of testing laboratories shall include assessment of prior experience in conducting indoor source emissions tests.
  2. The proposed laboratory shall be an independent company or organization not related to the manufacturer of the products to be tested.
  3. Submit documentation on proposed laboratory for review and approval by Owner.

## **ENVIRONMENTAL PROCEDURES**

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#### **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.
  - 1. Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.
  - 2. Unacceptable Packaging Materials: Polyurethane, polyisocyanate, polystyrene, polyethylene, and similar plastic materials such as “foam” plastics and “shrink-fit” plastics.
  - 3. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by the manufacturers or suppliers for reuse where the reclamation program exists or where a program can be developed for such reuse.
  - 4. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling.
  - 5. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of the construction waste management recycling program, or return to the material’s manufacturer for use by the manufacturer or supplier.
  - 6. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to the supplier or manufacturer for reuse where such program is available.
- B. Comply with the additional requirements specified in Section 01 7419, Construction Waste Management and Disposal.

#### **1.9 FIELD CONDITIONS**

- A. No smoking will be permitted in indoor Project site locations, in accordance with California Labor Code (Section 400-6413.5).
- B. Environmental Product Certification:
  - 1. Include certification that indicates cleaning materials comply with requirements of these Specifications.
- C. Construction Ventilation and Preconditioning:
  - 1. Temporary Construction Ventilation: Maintain sufficient temporary ventilation of areas where materials are being used that emit VOCs. Maintain ventilation continuously during installation, and until emissions dissipate following installation. If continuous ventilation is not possible utilizing the building’s HVAC system(s) then ventilation shall be supplied using open windows and temporary fans, sufficient to provide no less than three air changes per hour.
    - a. Period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in these Specifications, a time period of 72 hours shall be used.
    - b. Ventilate areas directly to outside; ventilation to other enclosed areas is not acceptable.



2. During dust producing activities, including drywall installation and finishing, turn ventilation system off, and openings in supply and return HVAC system shall be protected from dust infiltration. Provide temporary ventilation as required.
3. Preconditioning: Prior to installation, allow products which have odors and significant VOC emissions to off-gas in dry, well-ventilated space for 14 calendar days to allow for reasonable dissipation of odors and emissions prior to delivery to Project site and installation.
  - a. Condition products without containers and packaging to maximize off-gassing of VOCs
  - b. Condition products in ventilated warehouse or other building. Comply with substitution requirements for consideration of other locations.

D. Protection:

1. Moisture Stains: Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediately remove from site and properly dispose.
  - a. Take special care to prevent an accumulation of moisture on installed materials and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products
  - b. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
  - c. Replace moldy materials with new, undamaged materials.
2. Ducts: Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside of ducts.

## **PART 2 - PRODUCTS**

### **2.1 SUBSTITUTIONS**

- A. Requests for substitutions shall comply with requirements specified in Specification Section 01 3300, Submittals, and with the following additional information required where environmental issues are specified:
  1. Indicate how each proposed substitution complies with requirements for VOCs.
  2. Owner, in consultation with Architect reserve the right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for the specified materials.
  3. Comply with the specified recycled content and other environmental requirements.

## **PART 3 - EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- A. Sequencing:

## **ENVIRONMENTAL PROCEDURES**

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1. On-Site Application: Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
  2. Complete interior finish material installation no less than 14 days prior to Substantial Completion to allow for Building Flush Out as described in Paragraph 3.1B.
- B. Building Flush Out: Just prior to Substantial Completion, flush out building air continuously using maximum tempered outside air, or maximum amount of outside air while achieving reasonable indoor temperature, for at least 14 calendar days. Continuously is defined as 24 hours per day, 7 days a week. If interruptions of more than a few hours are required for testing and balancing purposes, extend flush out period accordingly in order to achieve the minimum 14 calendar day building flush out period.
1. When Contractor is required to perform touch-up work, provide temporary construction ventilation during installation and extend building flush-out by a minimum of 4 calendar days after touch-up installation is complete with maximum tempered outside air for 24 hours per day.
  2. If construction schedule permits, extend flush-out period beyond minimum building flush out period for an additional 15 days.
  3. Return ventilation system to normal operation following flush-out period to minimize energy consumption.

### **3.2 CLEANING**

- A. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces using cleaning and maintenance products that conform to standards as described in Part 1 of this Section.
- B. Clean equipment and fixtures to sanitary condition using cleaning and maintenance products that conform to standards as described in Part 1 of this Section.
- C. Products used for cleaning shall comply with Proposition 65 and the additional restrictions for volatile organic compounds specified in Section 01 6116.
- D. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.
- E. If ducts were not sealed during construction, and contain dust or dirt, clean ducts using HEPA vacuum immediately prior to Substantial Completion and prior to using ducts to circulate air. Oil film on sheet metal shall be removed before shipment to site. Ducts shall be inspected to confirm that no oil film is present. Remove oil film.
- F. Replace air filters, both pre and final filters, just prior to Substantial Completion.
- G. Remove and properly dispose of recyclable materials using construction waste management program described in Section 01 7419, Construction Waste Management and Disposal.

**3.3 PROTECTION**

- A. Protect interior materials from water intrusion or penetration where interior products are not intended for wet applications and are exposed to moisture.
- B. Protect installed products using methods that do not support growth of mold and mildew.
  - 1. Immediately remove from site materials with mold or mildew.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Standard reference abbreviations use in the Project Manual.
  - 2. Requirements for standard references use in the various Specification Sections.

### **1.2 STANDARD SPECIFICATIONS**

- A. The contract Documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections and tests published and issued by the organizations, societies, and associations. Such references are hereby made part of the Contract Documents to the extent required.
- B. When standard specifications are included by abbreviation and number only, it is assumed that the Contractor is familiar with and has ready access to the specified standards.
- C. When the effective date of a reference standard is not given, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of original issue of these Contract Documents, as indicated on the cover, shall govern the Work.
- D. Reference standards are not furnished with the contract Documents, because the Contractor, subcontractors, manufacturers, suppliers, and the trades involved are assumed to be familiar with their requirements
- E. Contractor shall obtain its own copies of required specified referenced publications.
- F. The specification or standard referred to shall have full force and effect as though printed in these specifications.
- G. In addition to those standards specifically referenced in the Specifications, comply with the accepted industry standards and trade association recommendations for the respective portions of Work.
- H. In the case of difference between referenced standards and the Contract Documents, the most stringent requirements prevail.

### **1.3 STANDARD SPECIFICATION ABBREVIATIONS**

- A. In addition to abbreviations indicated on the Drawings, references in the Project Manual to trade associations, technical societies, recognized authorities, and other institutions may include the following organizations, which are sometimes referred to by only the corresponding abbreviations. Not all abbreviations are listed, and not all listed abbreviations are used.
- B. Initialisms and Acronyms:

## **ABBREVIATIONS AND ACRONYMS**

### **SECTION 01 4213**

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- |     |          |   |
|-----|----------|---|
| 1.  | AA       | Aluminum Association  |
| 2.  | AAMA     | American Architectural Manufacturers Association                          |
| 3.  | AASHTO   | American Association of State Highway and Transportation Officials        |
| 4.  | AATCC    | American Association of Textile Chemists and Colorists                    |
| 5.  | ABAA     | Air Barrier Association of America  |
| 6.  | ACI      | American Concrete Institute   |
| 7.  | ACS      | Access Compliance Section (DSA)   |
| 8.  | ACSE     | American Society of Civil Engineers                                       |
| 9.  | ADA      | American with Disabilities Act  |
| 10. | AGA      | American Galvanizers Association  |
| 11. | AIA      | American Insurance Association (successor to NBFU)                        |
| 12. | AISC     | American Institute of Steel Construction                                  |
| 13. | AISI     | American Iron and Steel Institute   |
| 14. | AITC     | American Institute of Timber Construction                                 |
| 15. | ALSC     | American Lumber Standards Committee                                       |
| 16. | ANSI     | American National Standards Institute                                     |
| 17. | APA      | The Engineered Wood Association   |
| 18. | ASHRAE   | American Society of Heating, Refrigerating, and Air Conditioning          |
| 19. | ASTM     | ASTM International  |
| 20. | AWI      | Architectural Woodwork Institute  |
| 21. | AWPA     | American Wood Protection Association                                      |
| 22. | AWS      | American Welding Society  |
| 23. | BHMA     | Builders Hardware Manufacturers Association                               |
| 24. | CALGreen | California Green Building Standards Code                                  |
| 25. | CBC      | California Building Code  |
| 26. | CEC      | California Electrical Code  |
| 27. | CFC      | California Fire Code  |
| 28. | CLFMI    | Chain Link Fence Manufacturing Institute                                  |
| 29. | CMC      | California Mechanical Code  |
| 30. | CPC      | California Plumbing Code  |
| 31. | CRA      | California Redwood Association  |
| 32. | CRI      | Carpet and Rug Institute  |
| 33. | CRSI     | Concrete Reinforcing Steel Institute                                      |
| 34. | CS       | Commercial Standard of National Bureau of Standards (US Dept of Commerce) |
| 35. | DHI      | Door and Hardware Institute   |
| 36. | DSA      | Division of the State Architect   |
| 37. | DTSC     | Department of Toxic Substances Control                                    |
| 38. | EPA      | Environmental Protection Agency   |
| 39. | FDA      | U.S. Food and Drug Administration   |

**ABBREVIATIONS AND ACRONYMS**  
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40.	FLS	Fire & Life Safety (DSA)
41.	FM	Factory Mutual
42.	FS	Federal Specification of General Services Administration
43.	FSC	Forest Stewardship Council
44.	GA	Gypsum Association
45.	HMMA	Hollow Metal Manufacturers Association
46.	ICC-ES	International Code Council Evaluation Service
47.	ISO	International Organization for Standards
48.	MIA	Masonry Institute of America
49.	MMPA	Moulding and Millwork Producers Association
50.	MPI	Master Painters Institute
51.	NAAMM	National Association of Architectural Metal Manufactures
52.	NAAWS	North American Architectural Woodwork Standards
53.	NBFU	National Board of Fire Underwriters (See AIA)
54.	NBHA	National Builders Hardware Association
55.	NEC	National Electric Code of NFPA
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association
58.	NFSHSA	National Federation of State High School Associations
59.	NRCA	National Roofing Contractors Association
60.	OSHA	Occupational Safety and Health Administration
61.	PCA	Portland Cement Association
62.	PCI	Precast Concrete Institute
63.	PI	Project Inspector
64.	PLIB	Pacific Lumber Inspection Bureau
65.	RIS	Redwood Inspection Service (Grading Rules)
66.	SCAQMD	South Coast Air Quality Management District
67.	SEI	Structural Engineering Institute
68.	SDI	Steel Door Institute
69.	SJI	Steel Joist Institute
70.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
71.	SMF	Office of the State Fire Marshal
72.	SPR	Simplified Practice Recommendation (US Dept. of Commerce)
73.	SSMA	Steel Stud Manufacturers Association
74.	SSPC	The society for Protective Coatings
75.	SWPPP	Storm Water Pollution Prevention Plan
76.	TCNA	Tile Council of North America
77.	Title 19	California Code of Regulations - Public Safety
78.	Title 24	California Code of Regulations - Building Codes
79.	TMS	The Masonry Institute

## **ABBREVIATIONS AND ACRONYMS**

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- |     |       |   |
|-----|-------|---|
| 80. | UL    | Underwriter's Laboratories, Inc.                        |
| 81. | WCLIB | West Coast Lumber Inspection Bureau (successor to WCLA) |
| 82. | WDMA  | Window and Door Manufacturers Association               |
| 83. | WI    | Woodwork Institute                                      |
| 84. | WRCLA | Western Red Cedar Lumber Association                    |
| 85. | WWPA  | Western Wood Products Association                       |

### **END OF SECTION**

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acronyms.docx*

*Last Updated: December 16, 2021*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Definitions of terms and requirements pertaining to the contract documents,

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of Contract, including General and other Division 1 Specification Sections, apply to work of this section.

### **1.3 DESCRIPTION OF REQUIREMENTS**

- A. General Explanation: A substantial amount of specification language consists of definitions for terms found in other contract documents, including the drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.) Certain terms used in contract documents are defined in this Section. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the Contract Documents.
- B. General Requirements: The provisions or requirements of Division 1 sections apply to entire work of Contract and, where so indicated, to other elements which are included in project.
- C. Governing Regulations: Refer to General for requirements related to compliance with governing regulations.
- D. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in sections at first instance of use. Trade association names and titles of general standards are frequently abbreviated.

### **1.4 DEFINITIONS**

- A. Approve: Where used in conjunction with Architect's/ Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.
- B. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and



**DEFINITIONS AND STANDARDS**  
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"permitted" mean "directed by Architect", "requested by Architect", and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

- C. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, unloaded, ready for assembly, installation, etc., as applicable in each instance. See Also "Provide".
- D. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specification, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- E. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance. See also "Provide".
- F. Installer: The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in the operations they are engaged to perform.
- G. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to Architect for decision before proceeding.
- H. Project Site: The term "project site" is defined as the space available to the Contractor for performance of the work, either exclusively of or in conjunction with others performing other work as part of the project. The extent of the project site is shown on the drawings, and may or may not be identical with the description of the land upon which the project is to be built.
- I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
- J. Specialists, Assignments: In certain instances, specification test requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; they are also not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended

**DEFINITIONS AND STANDARDS**  
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to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

- K. Testing Laboratory: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.
- L. Trades: Except as otherwise indicated, the use of titles, such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

**1.5 DRAWING SYMBOLS:**

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect/Engineer for clarification before proceeding.

**1.6 INDUSTRY STANDARDS:**

- A. General Applicability of Standards: Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, applicable standards of the construction industry have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herewith. Refer to other contract documents for resolution of overlapping and conflicting requirements which result from the application of several different industry standards to the same unit of work. Refer to individual unit of work sections for indications of which specialized codes and standards the Contractor must keep at the project site, available for reference.
- B. Referenced Standards (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.
- C. Non-referenced Standards are hereby defined as having no particular applicability to the work, except as a general requirement of whether the work complies with standards recognized in the construction industry.
- D. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.

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- E. Copies of Standards: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.
1. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
  2. Although a certain number of copies of these standards may be required as a part of the submittal, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.
- F. Acronyms: Where acronyms are used in the specifications or other contract documents they are defined to mean the industry recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the test provision.

**1.7 GOVERNING REGULATIONS/AUTHORITIES**

- A. General: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the work.
- B. "Regulations" is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

**1.8 SUBMITTALS**

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipt for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Administrative and procedural requirements related to inspections, tests, and related quality control procedures required to be performed by the Contractor and that facilitate the Contractor's compliance with the Contract Documents.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3300, Submittal Procedures; submission of manufacturers' instructions and certificates.
- B. Section 01 4523, Testing and Inspecting Services, and DSA 103; Special Tests and Inspections required by authorities having jurisdiction and are the responsibility of Owner.
- C. Section 01 7700, Closeout Procedures.
- D. Specific requirements for testing, inspections, mockups, and other quality control requirements as described in the various Sections of the Specifications.

### **1.3 DEFINITIONS**

- A. Experienced: When used with an entity or individual, and unless otherwise specified, means having successfully completed a minimum of three previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
- D. Tests: Procedures intended to establish the quality, performance, or reliability of a product or system conducted by a qualified Testing Agency.
- E. Source Quality-Control Tests: Tests and inspections related to materials manufactured or fabricated away from the jobsite that will be incorporated into the work.
- F. Testing Agency: An independent entity engaged to perform specific tests, inspections, or both, is qualified to operate in California, and meets the additional requirements specified.
  - 1. Testing laboratory shall mean the same as Testing Agency.

**FIELD QUALITY CONTROL PROCEDURES**  
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- G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include Contract administration activities performed by Architect.

**1.4 REFERENCES AND STANDARD SPECIFICATIONS**

- A. General:
  - 1. The Contract Documents contain references to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections, and tests published and issued by the organizations, societies, and associations.
  - 2. Contractor shall obtain its own copies of required specified referenced publications.
  - 3. The specification or standard referred to shall have full force and effect as though printed in these Specifications.
  - 4. When the effective date of a reference standard is not specified, it shall be understood that the current edition or latest revision thereof and any amendments or supplements thereto in effect on the date of the DSA approval, shall govern the Work.
  - 5. The contractual relationships, duties, and responsibilities of the parties in Contract or those of the Architect shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- B. Products or workmanship specified by association, trade, or other consensus standards shall comply with requirements of the referenced standard or specification except when more rigid requirements are specified or are required by applicable codes.
- C. Conflicting Requirements:
  - 1. If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement.
  - 2. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

**1.5 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.

**1.6 INFORMATIONAL SUBMITTALS**

- A. Schedule of Tests and Inspections.
- B. Field Superintendent's Quality Control Responsibilities
- C. Procedures for inspection prior to subsequent Work or cover up.
- D. Qualifications of Contractor's Testing Agencies.
- E. Certified copies of Reports and Documents.

**1.7 CLOSEOUT SUBMITTALS**

- A. Permits, Licenses, and Certificates: Copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.
- B. Test and Inspection Log including final record for each test and inspection as specified in Part 3 and in accordance with Section 01 7839, Project Record Documents.

**1.8 REPORTS AND DOCUMENTS**

- A. Test and Inspection Reports: Prepare and submit certified written reports where specified in the Specification Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and re-inspecting.

**1.9 QUALITY ASSURANCE**

- A. Minimum Quantity or Quality Levels:

**FIELD QUALITY CONTROL PROCEDURES**  
**SECTION 01 4516**  
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1. The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.
  2. Refer uncertainties to Architect for a decision before proceeding.
- B. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- C. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- D. Correct conditions or workmanship not in conformance with specified standards or quality. Do so immediately after non-conformance item is discovered or within a reasonable time frame agreed upon with Construction Manager.
- E. Comply with manufacturers' instructions, including each step in sequence. Should manufacturers' instructions conflict with Contract Documents, request clarification from the Architect before proceeding.
- F. Comply with specified standards as minimum quality for the Work, except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- G. Perform Work by persons qualified to produce required and specified quality.
- H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- I. Upon delivery to the jobsite, materials and products shall be inspected for compliance with the Project Specifications.
1. Nonconforming materials, products, equipment, hardware, tools and/or safety devices shall be removed immediately from the general work area and stored within a secured area approved by the Owner as "NON CONFORMING MATERIALS AREA" to ensure that defective or nonconforming materials are not incorporated into or used on the project
  2. Materials or products shall not be removed from the designated area until they are deemed by the Architect to be in compliance, or until they are modified or fixed to meet the project specifications, or until they are removed from the jobsite for the purposes of disposal or shipment back to the manufacturer.

**1.10 CONTRACTORS TESTING AGENCY**

- A. Qualifications: At Contractor's expense, provide an independent testing laboratory nationally recognized according to 29 CFR 1910.7 and accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP,) or other independent agency with the experience and capability to conduct testing and inspecting indicated,

**FIELD QUALITY CONTROL PROCEDURES**  
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documented according to ASTM E329; with additional qualifications specified in individual Sections; and, where required, that is acceptable to authorities having jurisdiction.

- B. Testing Agency shall cooperate with Architect, Owner's Project Inspector, and Contractor in performance of duties.
- C. Testing Agency shall provide qualified personnel to perform required tests and inspections.
- D. Testing Agency shall not be authorized to release, revoke, alter, or increase the Contract Document requirements, approve or accept any portion of the Work, or perform any duties of Contractor.

**1.11 TESTS AND INSPECTIONS**

- A. Preconstruction Testing: Where preconstruction testing is specified to verify performance requirements, comply with the following as applicable:
  - 1. Contractor Responsibilities:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project unless approved by Architect in writing.
- B. Tests and Inspections indicated in individual Specification Sections shall be conducted by a qualified Testing Agency. The responsibilities of the Testing Agency shall be as follows:
  - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
  - 2. Notifying Architect, Owner's Project Inspector, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 3. Submit a certified written report of each test, inspection, and similar quality-control service to Architect and Owner's Project Inspector with copy to Contractor and to DSA.



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4. Submit a final report of tests and inspections at Substantial Completion which includes a list of unresolved deficiencies.
  5. Interpret tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  6. Retest and reinspect corrected work.
- C. Monitoring and Documentation: Contractor shall maintain testing and inspection reports including log of approved and rejected results as specified in Part 3.
1. Include work Architect has indicated as nonconforming or defective.
  2. Indicate corrective actions taken to bring nonconforming work into compliance with requirements.
  3. Comply with requirements of the California Division of the State Architect (DSA).

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 NOTIFICATIONS**

- A. Contractor shall provide the following notifications;
1. Owner's Project Inspector writing:
    - a. 24 hours in advance of starting new Work
    - b. 24 hours in advance of each test or inspection
  2. 48 hours' prior notice, minimum, to the Testing Agency for required tests and inspections.

**3.2 TEST AND INSPECTION FIELD BINDER**

- A. Contractor shall maintain in the Field Office a Test and Inspection Field Binder that includes a hard copy of the following documents:
1. Approved Quality Control Plan.
  2. Specification Sections that apply to the respective portions of work.
  3. RFI's, CCD's or other approved document that changes the work.
  4. Manufacturer's Installation Instructions (MII).
  5. Specific details of the Work as requested by the Inspector.
  6. Test and Inspection Log.

**3.3 TEST AND INSPECTION LOG**

- A. Prepare and maintain a record of tests and inspections using an electronic spreadsheet.
- B. Include the following information:

1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. List pertinent detail/sheet number.
  4. List pertinent Specification Section.
  5. Attach manufacturer's installation inspections if applicable.
  6. List and attach RFI's, ASI's or CCD's affecting the Work.
  7. Date Inspector verified work is acceptable.
- C. Final record for each test and inspection shall be submitted on Contractors letterhead and include the name of the responsible person to verify Work was in accordance with the approved Contract Documents.

### **3.4 MANUFACTURERS' FIELD SERVICES**

- A. When specified in respective Specification Sections, Contractor shall require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting and balancing of equipment as applicable, and to make appropriate recommendations. Contractor is responsible for proper notification of manufacturer's representative before installation of applicable work and for obtaining necessary inspection certificate stating that installation was observed and approved.
- B. Product Performance Verification: The supplier of products specified based on performance criteria shall, at the request of the Agency, inspect the installed product and certify conformance of the product to specified criteria under the installed conditions.
- C. Manufacturer's representative shall submit written report to the Architect listing observations and recommendations.

### **3.5 TOLERANCES - GENERAL**

- A. Monitor tolerance control of installed products or portions to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.6 DIMENSIONING AND TOLERANCES FOR ACCESSIBILITY**

- A. While it is recognized that construction practices generally permit a level of reasonable dimensional tolerance, the installation of items subject to compliance with the Americans with Disabilities Act Accessibility Guidelines and Chapter 11B of the California Building Code, typically does not allow such tolerances. Therefore, these dimensions are to be considered absolute and will be strictly enforced. Items found to be out of tolerance may require modification and/or replacement at Contractor's expense.

**FIELD QUALITY CONTROL PROCEDURES**  
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**3.7 REPAIR AND PROTECTION**

- A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes.
  - 2. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7329, Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**

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*Last Updated: August 28, 2020*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for Testing Laboratory.
  - 2. Contractor's responsibilities for facilitation of Testing and Inspections.

### **1.2 RELATED SECTIONS AND DOCUMENTS**

- A. DSA 103 - Structural Test & Inspections List.
- B. Division 23, Mechanical Work - Testing, adjusting, and balancing of systems.
- C. Individual Specification Sections: Inspections and tests required, and standards for testing.

### **1.3 REFERENCES**

- A. California Administrative Code (CAC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 SELECTION AND PAYMENT**

- A. Testing laboratory shall be approved by both the Architect and the Division of the State Architect.
- B. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing. Retesting costs for failed tests will be the Contractors responsibility and will be back-charged against the contract.
- C. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

### **1.5 LABORATORY REPORTS**

- A. After each inspection and test, promptly submit two copies of laboratory report to Owner, Architect, Contractor and DSA.
- B. Include:
  - 1. Date of issue,
  - 2. DSA Application and File numbers,
  - 3. Project title and number,
  - 4. Name of inspector,

## **TESTING AND INSPECTION SERVICES**

### **SECTION 01 4523**

**3431005**

5. Date and time of sampling or inspection,
6. Identification of product and Specification Section,
7. Location in the Project,
8. Type of inspection or test,
9. Date of test,
10. Results of test,
11. Conformance with Contract Documents.

C. When requested by Architect, provide interpretation of test results.

#### **1.6 LIMITS ON TESTING LABORATORY AUTHORITY**

- A. Laboratory may not release, revoke, alter or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the work.
- C. Laboratory may not assume any duties of Contractor.
- D. Laboratory has no authority to stop the work.

#### **1.7 CONTRACTOR RESPONSIBILITIES**

- A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs. Allow reasonable time for review and testing.
- B. Arrange for, and coordinate with, laboratory for all required testing and inspection. Provide adequate notice, in advance, for proper scheduling and processing of testing. The Inspector will not be responsible for scheduling or arranging for testing and inspection services.
- C. Cooperate with laboratory personnel, and provide access to the work and to manufacturer's facilities.
- D. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at the source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- E. Notify Architect, Inspector, Structural Engineer (when applicable) and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

**END OF SECTION**

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*Last Updated: December 16, 2021*

**DSA-103**

Issued 9/1/2017

# List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

School Name		District	
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**IMPORTANT:** This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.

**NOTE:** This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

**INSTRUCTIONS:** Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected. **For more information on use of this form, see DSA-103.INSTR.**

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE <sup>1</sup>	PERFORMED BY <sup>2</sup>	CODE REFERENCE AND NOTES
+	SOILS			
+	CONCRETE			Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13
+	MASONRY			TMS 402-13/ACI 530-13/ASCE 5-13 Table 3.1.3 & TMS 602-13/ACI 530.1-13/ASCE 6-13 Table 5
+	STEEL, ALUMINUM			Table 1705A.2.1, AISC 303-10, AISC 360-10, AISC 341-10, AISC 358-10, AISI S100-07/S2-10
+	WOOD			
+	OTHER			

**DSA-103**

Issued 9/1/2017

# **List of Required Structural Tests & Special Inspections - 2016 CBC**

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

**List of required verified report(s):**
**KEY to Columns**

1 Type -	2 Performed By -
<b>Continuous</b> – Indicates that a continuous special inspection is required	<b>GE</b> – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
<b>Periodic</b> – Indicates that a periodic special inspection is required	<b>LOR</b> – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
<b>Test</b> – Indicates that a test is required	<b>SI</b> – Indicates that the special inspection is to be performed by a special inspector

Name of Architect or Engineer in general responsible charge

Name of Structural Engineer (When structural design has been delegated)

Signature of Architect or Structural Engineer

date

 IDENTIFICATION STAMP  
 DIV OF THE STATE ARCHITECT  
 APP. #

 AC N/A F/LS N/A SS \_\_\_\_\_

DATE \_\_\_\_\_

**Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing**

**DSA-103**

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## List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.	
	<b>Soils:</b>
X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
	<b>Concrete/Masonry:</b>
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.
X	4. Epoxy shear dowels in site flatwork.

Exempted by Design Prof.	
	<b>Welding:</b>
X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) <= 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.
(Optional) List details for applicable exempt items:	





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Issued 9/1/2017

# List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.:

Date Submitted:

Revised:

Revised:

(Optional) List details for applicable exempt items:

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes general requirements that apply to implementation of the California Energy Code-required acceptance testing without regard to specific systems, assemblies, or components.
- B. Related Sections:
  - 1. Division 01 Section "Facilities Exterior Enclosure Commissioning" for commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.
  - 2. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
  - 3. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
  - 4. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.

### **1.2 ACCEPTANCE TESTING TEAM**

- A. Members Appointed by Contractor: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the acceptance testing process through coordinated action. The acceptance testing team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors.
- B. Members Appointed by Owner:
  - 1. Acceptance Testing Agency: The designated company that plans, schedules, and coordinates the acceptance testing team to implement the acceptance testing process. Owner will engage the acceptance testing agency under a separate contract. All individuals that perform testing from the Acceptance Testing Agency on the project site shall be a certified Acceptance Test Technician (ATT).
    - a. A listing of certified ATT is available at: <https://www.energy.ca.gov/programs-and-topics/ptograms/acceptance-test-technician-certification-provider-program/acceptance> .

### **1.3 CONTRACTOR'S RESPONSIBILITIES**

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform acceptance testing activities including, but not limited to, the following:

## **ENERGY CODE - REQUIRED ACCEPTANCE TESTING**

### **SECTION 01 4533.13**

#### **3431005**

1. Evaluate performance deficiencies identified in acceptance testing reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the acceptance testing agency for resolution of issues.
3. Participate in acceptance testing meetings.
4. Integrate and coordinate acceptance testing process activities with construction schedule.
5. Provide acceptance testing agency with information required to complete checklists.
6. Review and accept checklists provided by the acceptance testing agency.
7. Review and accept test procedures provided by the acceptance testing agency.
8. Complete acceptance testing process test procedures as required by acceptance testing agency.

#### **1.4 ACCEPTANCE TESTING AGENCY RESPONSIBILITIES**

- A. Convene acceptance testing meetings.
- B. Provide Project-specific acceptance testing checklists and procedures.
- C. Prepare and maintain completed checklist log.
- D. Provide Project Inspectors the forms to confirm the required Acceptance Tests have been completed. Final certificate of occupancy cannot be issued until all certificates of acceptance forms are received by the Project Inspector.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

#### **END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: VOC restrictions for product categories listed below under Article "DEFINITIONS" and in compliance with the following.
  - 1. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code.
- B. Products of each category that are installed in the project must comply; applicable laws and ordinances do not allow for partial compliance.
- C. Listing of a product in these Specifications shall not be construed as a solicitation or requirement to use any product or combination of products in violation of the requirements of South Coast Air Quality Management District Rule No.1168, as described in Rule 1168(g).
  - 1. If a listed product does not meet the requirements of this rule, request approval for use of an alternate product by the same or another manufacturer meeting the requirements of this rule.
  - 2. Do not use products which do not meet the requirements of this rule.

### **1.2 RELATED REQUIREMENTS**

- A. Divisions 01 through 33 contain related requirements specific to the work of each of these Sections. Requirements may or may not include reference to this Section.
- B. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.

### **1.3 REFERENCES**

- A. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at [www.chps.net/](http://www.chps.net/).

### **1.4 DEFINITIONS**

- A. VOC-Restricted Products: Products of each of the following categories when installed or applied on-site:
  - 1. Adhesives, sealants, and sealer coatings, regardless of specification Section or Division.
- B. Adhesives: Gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not.

## **VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**

### **SECTION 01 6116.10**

**3431005**

- C. Sealants: Gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

#### **1.5 SUBMITTAL REQUIREMENTS**

- A. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
- B. Verification of Compliance: Submit for each different product in each applicable category.
  - 1. Identify evidence submittals with the words "CALGreen VOC Compliance Report".
- C. Installer Certifications for Accessory Materials:
  - 1. Require each installer of any type of product, not just the products for which VOC restrictions are specified, to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of their products, or 2) that such products used comply with these requirements.
  - 2. Use the form following at the end of Part 3 in this Section for Installer certifications.

#### **1.6 QUALITY ASSURANCE**

- A. Manufacturer's Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this Section.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. General:
  - 1. Provide products conforming to local, State and Federal government requirements limiting the amount of volatile organic compounds contained in the product, for its intended application. If specified product exceeds current requirement, provide conforming product at no additional cost.
  - 2. Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168 and less where required by code.
  - 3. Products are specified in multiple Sections throughout these Specifications.
- B. Composite Wood Products: Comply with CALGreen Section 5.504 and Table 5.504.4.5 formaldehyde limits for hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior and exterior of the building.
  - 1. Verification of Compliance: Acceptable types are:
    - a. Certification by manufacturer that product complies with requirements.
    - b. Published product data showing compliance with requirements.

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
**SECTION 01 6116.10**  
**3431005**

- c. Chain of custody certifications.
- d. Product labeled and invoiced as meeting the Composite Wood Products regulation (CCR, Title 17, Section 93120, et seq.).
- e. Products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269, or European 636 3S standards.
- f. Other method acceptable to enforcing agency.

<b>Table 5.504.4.5 FORMALDEHYDE LIMITS</b>	
<b>Maximum Formaldehyde Emissions in Parts per Million</b>	
<b>Product</b>	<b>Current Limit</b>
Hardwood plywood veneer core	0.05
Hardwood plywood composite core	0.05
Particleboard	0.09
Medium density fiberboard	0.11
Thin medium density fiberboard <sup>1</sup>	0.13
Note 1: Thin medium density fiberboard has a maximum thickness of 5/16 inch (8 mm).	

- C. Insulation: Comply with CALGreen Section 5.504.4.8.2 formaldehyde limits for insulation.
  - 1. Verification of Compliance: Documentation from manufacturer verifying thermal insulation materials meet the pollutant emission limits of one of the following.
    - a. The VOC-emission limits defined in 2014 CACHPS criteria and listed on its High Performance Products Database.
    - b. California Department of Public Health 2010 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010 (also known as Specification 01350.)
- D. Adhesives, Including Carpet and Cushion Adhesives: Comply with CALGreen Section 5.504 and Table 5.504.4.1.
  - 1. Verification of Compliance: Acceptable types are:
    - a. Report of laboratory testing performed in accordance with requirements.
    - b. Published product data showing compliance with requirements.
    - c. Certification by manufacturer that product complies with requirements.
  - 2. Aerosol Adhesives: Comply with Table 5.504.4.1 of CalGreen Section 5.504, and California Code of Regulations Title 17, Section 94507.
    - a. Verification of Compliance: Acceptable types are:
      - 1) Current GreenSeal Certification.
      - 2) Report of laboratory testing performed in accordance with GreenSeal GS-36 requirements.

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
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3) Published product data showing compliance with requirements.

3. Products used shall comply with the following limits.

<b>Table 5.504.4.1 ADHESIVE VOC LIMIT</b>	
<b>Architectural Applications</b>	<b>Current VOC Limit</b>
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Outdoor Carpet Adhesives	150
Wood Flooring Adhesive	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Single Ply Roof Membrane Adhesives	250
Other adhesives not specifically listed	250
<b>VOC Limits and Effective Dates**</b>	
<b>Specialty Applications</b>	<b>Current VOC Limit</b>
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic Cement Welding	250
Adhesive Primer for Plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Top and Trim Adhesive	250
** The specified limits remain in effect unless revised limits are listed in the current governing edition of CalGreen.	
For adhesives, adhesive bonding primers, or any other primer not regulated by the above two Tables and applied to the following substrates, the following limits shall apply:	
<b>Substrate Specific Applications</b>	<b>Current VOC Limit</b>
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass 80	80
Note: If an adhesive is used to bond dissimilar substrates together the adhesive with the highest VOC content shall be allowed.	

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E. Joint Sealants: Comply with CALGreen Section 5.504 and Table 5.504.4.2.

1. Verification of Compliance: Acceptable types are:
  - a. Report of laboratory testing performed in accordance with requirements.
  - b. Published product data showing compliance with requirements.
  - c. Certification by manufacturer that product complies with requirements.
2. Products used shall comply with the following limits.

<b>Table 5.504.4.2 SEALANT VOC LIMIT</b>	
Less Water and Less Exempt Compounds in Grams per Liter	
Sealant	Current VOC Limit
Architectural	250
Marine Deck	760
Non-Membrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other	420
Sealant Primers	Current VOC Limit
Architectural	250 775
Non-Porous	
Porous	
Modified Bituminous	500
Marine Deck	760
Other	750
For low-solid adhesives or sealants the VOC limit is expressed in grams per liter of material; for all other adhesives and sealants, VOC limits are expressed as grams of VOC per liter of adhesive or sealant less water and less exempt compounds.	

3. Restricted Components: In addition to the specified VOC limits, paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.



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- n. Formaldehyde.
- o. Hexavalent chromium.
- p. Isophorone.
- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

**PART 3 - EXECUTION**

**3.1 FIELD QUALITY CONTROL**

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality, including fines by authorities, due to installation of non-compliant products shall be borne by Contractor.

**3.2 CERTIFICATION FORM**

- A. Use of this Form:
  - 1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
  - 2. Contractor is required to obtain and submit this Form from each installer of work on this project.
  - 3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
  - 4. If these accessory materials have been used, attach to this form product data and MSDS sheet for each such product.

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**ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM**

IDENTIFICATION:

Project Name: \_\_\_\_\_

Project No.: \_\_\_\_\_

Architect: \_\_\_\_\_

PRODUCT CERTIFICATION: I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

Product data and MSDS sheets are attached.

CERTIFIED BY (Installer/Manufacturer/Supplier Firm):

Firm Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_ (officer of company)

Date: \_\_\_\_\_

**VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS**  
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**END OF SECTION**

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compound (voc) restrictions.docx  
Last Updated: January 18, 2022*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Cutting and patching:
    - a. For construction that is defective, or as required to install incomplete work shown in the Contract Documents.
    - b. To extend work or restore existing construction to its original condition, unless otherwise specified or shown on the drawings.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.
- B. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.
- C. Section 01 3516, Alteration Project Procedures.

### **1.3 REFERENCES**

- A. California Building Code (CBC), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 ADMINISTRATION REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

### **1.5 ACTION SUBMITTALS**

- A. Manufacturer's Data: For products not included in the specifications, submit list and complete descriptive data of all products proposed for use. Include manufacturer's specifications, and installation instructions.
- B. Samples: As requested by the Architect.

**CUTTING AND PATCHING**  
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C. Request for Cutting and Patching:

1. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
  - a. Work of the Owner or any separate contractor.
  - b. Structural value or integrity of any element of the Project.
  - c. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
  - d. Efficiency, operational life, maintenance or safety of operational elements.
  - e. Visual qualities of sight-exposed elements.
  - f. No cutting of structural elements is allowed unless shown on the Division of the State Architect's approved drawings
2. Request shall include:
  - a. Project identification.
  - b. Description of affected work.
  - c. Necessity for cutting, alteration or excavation.
  - d. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
  - e. Description of proposed work:
    - 1) Scope of cutting, patching, alteration, or excavation.
    - 2) Trades who will execute the work.
    - 3) Products proposed to be used.
    - 4) Extent of refinishing to be done.
  - f. Alternatives to cutting and patching.
  - g. Cost proposal, when applicable.
  - h. Written permission of any separate contractor whose work will be affected.

D. Should conditions of work or schedule indicate change of products from original installation, Contractor shall submit request for substitution.

E. Submit written notice to Architect designating date and time work will be uncovered.

**1.6 INFORMATIONAL SUBMITTALS**

A. Sample of manufacturer's warranty, where applicable.

B. Sustainable Design:

1. General:
  - a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
  - b. Sustainable design submittals are in addition to other submittals.
2. The following information shall be provided:
  - a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

**1.7 CLOSEOUT SUBMITTALS**

- A. Warranty/Guarantee: Submit executed warranties and Subcontractors' guarantees for products not included in the specifications.

**1.8 QUALITY ASSURANCE**

- A. Qualifications for Installers:
  - 1. General: As specified in the product specifications.
  - 2. Employ specially qualified installers or fabricators to perform cutting and patching for:
    - a. Weather-exposed or moisture-resistant elements.
    - b. Sight-exposed finished surfaces.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. Single-Source Responsibility: Use materials and products of one manufacturer whenever possible.
- D. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

**1.9 FIELD CONDITIONS**

- A. Make and be responsible for all field dimensions necessary for proper fitting and completion of work. Report discrepancies to Architect before proceeding.

**1.10 WARRANTY**

- A. Manufacturer: In addition to the Contractor's and Subcontractor's Guarantee, furnish Owner with manufacturers' available fully executed written warranties for products not included in the specifications against defects in materials and workmanship

**PART 2 - PRODUCTS**

**2.1 DESIGN AND PERFORMANCE CRITERIA**

- A. Sustainable Design:
  - 1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.

**2.2 MATERIALS**

- A. Comply with these specifications, standards and manufacturer's recommendations for each specific product involved.

**CUTTING AND PATCHING**  
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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Inspect conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

**3.2 PREPARATION**

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of Project which may be exposed by cutting and patching work, and maintain excavations free from water.

**3.3 INSTALLATION**

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
  - 1. Removal or cutting of concrete paving shall occur at adjacent expansion joint or control joint.
- B. Execute fitting and adjustment of products to provide finished installation to comply with specified products, functions, tolerances and finishes.
- C. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
- D. Fit work airtight to pipe, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish entire unit.

**3.4 CLEANING AND ADJUSTING**

- A. In the event of damage, make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

**CUTTING AND PATCHING**  
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- B. Upon completion of installation, thoroughly wash surfaces and remove foreign material. Leave entire work in neat, orderly, clean and acceptable condition.

**3.5 PROTECTION**

- A. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- B. Exposed finishes shall be free from scratches, dents, permanent discolorations and other defects in workmanship or material.

**END OF SECTION**

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*Last Updated: December 16, 2021*



**SECTION 01 7419A**  
**CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN**  
*(Submit After Award of Contract and Prior to Start of Work)*

Project Title:		
Contract or Work Order No.:		
Contractor's Name:		
Street Address:		
City:	State:	Zip:
Phone: ( )	Fax: ( )	
E-Mail Address:		
Prepared by: (Print Name)		

Date Submitted:		
Project Period:	From:	TO:

**Reuse, Recycling or Disposal Processes To Be Used**

*Describe the types of recycling processes or disposal activities that will be used for material generated in the project. Indicate the type of process or activity by number, types of materials, and estimated quantities that will be recycled or disposed in the sections below:*

- 01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)
- 02 - Salvaging building materials or salvage items at an off site salvage or re-use center (i.e. lighting, fixtures)
- 03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)
- 04 - Recycling source separated materials at an off site recycling center (i.e. scrap metal or green matls)
- 05 - Recycling commingled loads of C&D matls at an off site mixed debris recycling center or transfer station
- 06 - Recycling material as Alternative Daily Cover at landfills
- 07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
- 08 - Disposal at a landfill or transfer station.
- 09 - Other (please describe) \_\_\_\_\_

**Types of Material To Be Generated**

*Use these codes to indicate the types of material that will be generated on the project*

A = Asphalt	C = Concrete	M = Metals	I = Mixed Inert	G = Green Matls
D = Drywall	P/C=Paper/Cardboard	W/C = Wire/Cable	S= Soils (Non Hazardous)	
M/C = Miscellaneous Construction Debris	R = Reuse/Salvage	W = Wood	O = Other (describe)	

Facilities Used: Provide Name of Facility and Location (City)

Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period

Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).

**SECTION I - RE-USED/RECYCLED MATERIALS**

*Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.*

Type of Material	Type of Activity	Facility to be Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) M	04	ABC Metals, Los Angeles	24	355		
<b>a. Total Diversion</b>			0	0	0	0

[PROJECT TITLE]  
[DATE]

Contractor's Construction Waste and Recycling Plan  
Section 01 7419A-1

SECTION 01 7419A  
CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN  
Continued

SECTION II - DISPOSED MATERIALS							
<i>Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.</i>							
Type of Material	Type of Activity	Facility to be Used/Location		Total Truck Loads	Total Quantities		
					Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles		2	35		
b. Total Disposal					0	0	0

SECTION III - TOTAL MATERIALS GENERATED						
<i>This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation)</i>						
				Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled				0	0	0
b. Total Disposed				0	0	0
c. Total Generated				0	0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
<i>Add totals from Section I + Section II</i>						
		Tons	Cubic Yards	Other Wt.		
a. Materials Re-Used and Recycled		0				
b. Materials Disposed		0				
c. Total Materials Generated (a. + b. = c.)		0	0	0		
d. Landfill Diversion Rate (Tons Only)*		#DIV/0!				

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments (Provide any additional information pertinent to planned reuse, recycling, or disposal activities):

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)

Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)

Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

Drywall Scrap: .20

Wood Scrap: .16

SECTION 01 7419B  
CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT  
(Submit With Each Progress Payment)

Project Title:		
Contract or Work Order No.:		
Contractor's Name:		
Street Address:		
City:	State:	Zip:
Phone: ( )	Fax: ( )	
E-Mail Address:		
Prepared by: (Print Name)		

Date Submitted:		
Period Covered:	From:	To:

Reuse, Recycling or Disposal Processes Used
<p><i>Describe the types of recycling processes or disposal activities used for material generated in the project. Indicate the type of process or activity by number, types of materials, and quantities that were recycled or disposed in the sections below:</i></p> <p>01 - Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick)</p> <p>02 - Salvaging building materials or salvage items at an off site salvage or re-use center (i.e. lighting, fixtures)</p> <p>03 - Recycling source separated materials on site (i.e. crushing asphalt/concrete for reuse or grinding for mulch)</p> <p>04 - Recycling source separated materials at an off site recycling center (i.e. scrap metal or green matls)</p> <p>05 - Recycling commingled loads of C&amp;D matls at an off site mixed debris recycling center or transfer station</p> <p>06 - Recycling material as Alternative Daily Cover at landfills</p> <p>07 - Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).</p> <p>08 - Disposal at a landfill or transfer station.</p> <p>09 - Other (please describe) _____</p>

Types of Material Generated
<p><i>Use these codes to indicate the types of material that were generated on the project</i></p> <p>A = Asphalt      C = Concrete      M = Metals      I = Mixed Inert      G = Green Matls</p> <p>D = Drywall      P/C=Paper/Cardboard      W/C = Wire/Cable      S= Soils (Non Hazardous)</p> <p>M/C = Miscellaneous Construction Debris      R = Reuse/Salvage      W = Wood      O = Other (describe)</p> <p>Facilities Used: Provide Name of Facility and Location (City)</p> <p>Total Truck Loads: Provide Number of Trucks Hauled from Site During Reporting Period</p> <p>Total Quantities: If scales are available at sites, report in tons. If not, quantify by cubic yards. For salvage/reuse items, quantify by estimated weight (or units).</p>

SECTION I - RE-USED/RECYCLED MATERIALS						
<i>Include all recycling activities for source separated or mixed material recycling centers where recycling occurred.</i>						
Type of Material	Type of Activity	Facilities Used/Location	Total Truck Loads	Total Quantities		
(ex.) M	04	ABC Metals, Los Angeles	24	Tons	Cubic YD	Other Wt.
a. Total Diversion			0	0	0	0

SECTION 01 7419B  
CONTRACTOR'S REUSE, RECYCLING, AND DISPOSAL REPORT  
Continued

SECTION II - DISPOSED MATERIALS						
<i>Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling occurred.</i>						
Type of Material	Type of Activity	Facilities Used/Location	Total Truck Loads	Total Quantities		
				Tons	Cubic YD	Other Wt.
(ex.) D	08	DEF Landfill, Los Angeles	2	35		
b. Total Disposal				0	0	0

SECTION III - TOTAL MATERIALS GENERATED						
<i>This section calculates the total materials generated during the project period (Reuse/Recycle + Disposal = Generation)</i>						
				Tons	Cubic YD	Other Wt.
a. Total Reused/Recycled				0	0	0
b. Total Disposed				0	0	0
c. Total Generated				0	0	0

SECTION IV - CONTRACTOR'S LANDFILL DIVERSION RATE CALCULATION						
<i>Add totals from Section I + Section II</i>						
	Tons	Cubic Yards	Other Wt.			
a. Materials Re-Used and Recycled	0					
b. Materials Disposed	0					
c. Total Materials Generated (a. + b. = c.)	0	0	0			
d. Landfill Diversion Rate (Tons Only)*	#DIV/0!					

\* Use tons only to calculate recycling percentages: Tons Reused/Recycled/Tons Generated = % Recycled

Contractor's Comments ( <i>Provide any additional information pertinent to planned reuse, recycling, or disposal activities</i> ):						

Notes:

1. Suggested Conversion Factors: From Cubic Yards to Tons (Use when scales are not available)

Asphalt: .61 (ex. 1000 CY Asphalt = 610 tons. Applies to broken chunks of asphalt)

Concrete: .93 (ex. 1000 CY Concrete = 930 tons. Applies to broken chunks of concrete)

Ferrous Metals: .22 (ex. 1000 CY Ferrous Metal = 220 tons)

Non-Ferrous Metals: .10 (ex. 1000 CY Non-Ferrous Metals = 100 tons)

Drywall Scrap: .20

Wood Scrap: .16

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes: Requirements and procedures for ensuring optimal diversion of construction waste materials generated by the Work from landfill disposal within the limits of the Construction Schedule and Contract Sum.
  - 1. The Work of this Contract requires that a minimum of 65% by weight of the construction and demolition materials generated in the Work is diverted from landfill disposal through a combination of re-use and recycling activities.
  - 2. CAL-Green: Alternate waste reduction methods developed in cooperation with local agencies if diversion or recycle facilities capable of compliance with CAL-Green requirements do not exist within the haul boundary of the jobsite (California Code of Regulations, Title 24, Part 11, 5.408).
  - 3. Requirements for submittal of Contractor's Construction Waste and Recycling Plan prior to the commencement of the Work.
  - 4. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments submitted to the Architect.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3516, Alteration Project Procedures.
- B. Section 01 5000, Temporary Facilities & Controls.
- C. Section 01 7329, Cutting and Patching.
- D. Section 01 8113, Sustainable Design Requirements, for CAL-Green general requirements and procedures.

### **1.3 REFERENCES AND STANDARDS**

- A. California Green Building Standards Code (CALGreen), edition as noted on the drawings, as adopted by the California Division of the State Architect (DSA).

### **1.4 DEFINITIONS**

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations. A Class III landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Enforcement Agency (EA).
- B. Construction and Demolition Debris: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous as defined in California Code of Regulations, Title 22, Section 66261.3 et seq. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing

**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**  
**SECTION 01 7419**  
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material, ceramic tile, carpeting, plastic pipe, and steel. The debris may be commingled with rock, soil, tree stumps, and other vegetative matter resulting from land clearing and landscaping for construction or land development projects.

- C. C&D Recycling Center: A facility that receives only construction and demolition debris material that has been separated for reuse prior to receipt, in which the residual (disposed) amount of waste in the material is less than 10% of the amount separated for reuse by weight.
- D. Disposal: Final deposition of construction and demolition or inert debris into land, including stockpiling onto land of construction and demolition debris that has not been sorted for further processing or resale, if such stockpiling is for a period of time greater than 30 days; and construction and demolition debris that has been sorted for further processing or resale, if such stockpiling is for a period of time greater than one year, or stockpiling onto land of inert debris that is for a period of time greater than one year.
- E. Enforcement Agency (EA): Enforcement agency is the authority having jurisdiction within the Project location.
- F. Inert Disposal Facility or Inert Waste Landfill: A disposal facility that accepts only inert waste such as soil and rock, fully cured asphalt paving, uncontaminated concrete (including fiberglass or steel reinforcing rods embedded in the concrete), brick, glass, and ceramics, for land disposal.
- G. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- H. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- J. Reuse. The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- K. Separated for Reuse. Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream for the purpose of additional sorting or processing those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw material for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace, and includes materials that have been "source separated".
- L. Solid Waste: All putrescible and nonputrescible solid, semisolid, and liquid wastes, including garbage, trash, refuse, paper, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles and parts thereof, discarded home and industrial appliances, dewatered, treated, or chemically fixed sewage sludge which is not hazardous waste, manure, vegetable or animal solid and semisolid wastes, and other

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discarded solid and semisolid wastes. "Solid waste" does not include hazardous waste, radioactive waste, or medical waste as defined or regulated by State law.

- M. Source-Separated: Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation, for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.
- N. Waste Hauler: A company that possesses a valid permit from the local waste management authority having jurisdiction to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

## **1.6 ACTION SUBMITTALS**

- A. Contractor's Construction Waste and Recycling Plan:
  - 1. Review Contract Documents and estimate the types and quantities of materials under the Work that are anticipated to be feasible for on-site processing, source separation for re-use or recycling. Indicate the procedures that will be implemented in this program to effect jobsite source separation, such as, identifying a convenient location where dumpsters would be located, putting signage to identify materials to be placed in dumpsters, etc.
  - 2. Prior to commencing the Work, submit Contractor's Construction Waste and Recycling Plan. Submit in format provided with this specification section. The Plan must include, but is not limited to the following:
    - a. Contractor's name and project identification information;
    - b. Procedures to be used;
    - c. Materials to be re-used and recycled;
    - d. Estimated quantities of materials;
    - e. Names and locations of re-use and recycling facilities/sites;
    - f. Tonnage calculations that demonstrate that Contractor will re-use and recycle a minimum of 65% by weight of the construction waste materials generated by the Work.
  - 3. Contractor's Construction Waste and Recycling Plan must be approved by the Architect prior to the start of Work.

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4. Contractor's Construction Waste and Recycling Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures

**1.7 INFORMATIONAL SUBMITTALS**

**A. Contractor's Reuse, Recycling, and Disposal Report:**

1. Submit Contractor's Reuse, Recycling, and Disposal Report on the form provided with this specification section with each Application & Certificate for Payment. Failure to submit the form and its supporting documentation will render the Application & Certificate for Payment incomplete and delay progress payments. If applicable, include manifests, weight tickets, receipts, and invoices specifically identifying the Project for re-used and recycled materials:
  - a. Reuse of building materials or salvage items on site (i.e. crushed base or red clay brick).
  - b. Salvaging building materials or salvage items at an offsite salvage or reuse center (i.e. lighting, fixtures).
  - c. Recycling source separated materials on site (i.e. crushing asphalt/concrete for base course, or grinding for mulch).
  - d. Recycling source separated material at an offsite recycling center (i.e. scrap metal or green materials).
  - e. Use of material as Alternative Daily Cover (ADC) at landfills.
  - f. Delivery of soils or mixed inerts to an inert landfill for disposal (inert fill).
  - g. Disposal at a landfill or transfer station (where no recycling takes place).
  - h. Other (describe).
2. Contractor's Reuse, Recycling, and Disposal Report must quantify all materials generated in the Work, disposed in Class III landfills, or diverted from disposal through recycling. Indicate zero (0) if there is no quantity to report for a type of material. As indicated on the form:
  - a. Report disposal or recycling either in tons or in cubic yards. If scales are available at disposal or recycling facility, report in tons; otherwise, report in cubic yards. Report in units for salvage items when no tonnage or cubic yard measurement is feasible.
  - b. Indicate locations to which materials are delivered for reuse, salvage, recycling, accepted as daily cover, inert backfill, or disposal in landfills or transfer stations.
  - c. Provide legible copies of weight tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.
    - 1) Indicate project title, project number, progress payment number, name of the company completing the Contractor's Report and compiling backup documentation, the printed name, signature, and daytime phone number of the person completing the form, the beginning and ending dates of the period covered on the Contractor's Report, and the date that the Contractor's Report is completed.



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3. Demonstrate compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green" 5.408.2, to the satisfaction of the enforcing agency.
  - a. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  - b. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

**PART 2 - PRODUCTS-NOT USED**

**PART 3 - EXECUTION**

**3.1 WASTE MANAGEMENT PLAN**

- A. Implement procedures for disposal of materials, as specified in Contractor's Construction Waste and Recycling Plan, which are not diverted for re-use, salvage or recycling.
  1. Identify materials to be diverted from disposal by efficient usage, recycling, reuse on the project, or salvage for future use or sale.
  2. Determine if materials will be sorted on-site or mixed.
  3. Identify diversion facilities where material collected will be taken.
  4. Specify that quantities of diverted material will be calculated by weight or volume, but not both.

**3.2 SALVAGE, RE-USE, RECYCLING AND PROCEDURES**

- A. Re-use, Salvage, and Recycling Facilities: As specified in Contractor's Construction Waste and Recycling Plan.
- B. Develop and implement procedures to re-use, salvage, and recycle new construction and excavation materials, based on the Contract Documents, the Contractor's Construction Waste and Recycling Plan, estimated quantities of available materials, and availability of recycling facilities. Procedures may include on-site recycling, source separated recycling, and/or mixed debris recycling efforts.
  1. Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.
  2. Source separate new construction, excavation and demolition materials including, but not limited to the following types.
    - a. Asphalt.
    - b. Concrete, concrete block, slump stone (decorative concrete block), and rocks.
    - c. Drywall.
    - d. Green materials (i.e. tree trimmings and land clearing debris).

**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**  
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- e. Metal (ferrous and non-ferrous).
  - f. Miscellaneous Construction Debris.
  - g. Paper or cardboard.
  - h. Red Clay Brick.
  - i. Reuse or Salvage Materials
  - j. Soils.
  - k. Wire and Cable.
  - l. Wood.
  - m. Other (describe)
3. Miscellaneous Construction Debris: Develop and implement a program to transport loads of mixed (commingled) new construction materials that cannot be feasibly source separated to a mixed materials recycling facility

**3.3 DISPOSAL OPERATIONS AND WASTE HAULING**

- A. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.
- B. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority having jurisdiction.
- C. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, prior to delivering materials.
- D. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
- E. Do not burn, bury or otherwise dispose of solid waste on the project job-site.

**3.4 RE-USE AND DONATION OPTIONS**

- A. Implement a re-use program to the greatest extent feasible. Options may include:
  - 1. California Materials Exchange (CAL-MAX) Program is sponsored by the California Integrated Waste Management Board. CAL-MAX is a free service provided by the California Integrated Waste Management Board, designed to help businesses find markets for materials that traditionally would be discarded. The premise of the CAL-MAX Program is that material discarded by one business may be a resource for another business. To obtain a current Materials Listings Catalog, call CAL-MAX/California Integrated Waste Management Board at (916) 255-2369 or send a FAX to (916) 255-2200. The CALMAX Catalog is available through the Internet Site at <http://www.ciwmb/ca.gov/calmax>.

**3.5 REVENUE**

- A. Revenues or other savings obtained from recycled, re-used, or salvaged materials shall accrue to Contractor unless otherwise noted in the Contract Documents

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**END OF SECTION**

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management and disposal.docx  
Last Updated: December 16, 2021*

**1.1 SUMMARY**

- A. Section Includes: Administrative and procedural requirements for Contract closeout.
- B. These requirements supplement those included in the General Conditions and are subject to modification upon mutual agreement between the Architect, Owner, and Contractor.

**1.2 FINAL CLEANING**

- A. Immediately prior to completion and occupancy, remove marks, stains, fingerprints, dust, dirt and paint drippings resulting from work of this project, including roofs, walls, floors, sidewalks, paving and other finished surfaces.
- B. Contractor shall engage the services of an independent, professional cleaning service to perform final cleaning after Contractor's final clean-up is completed.
- C. Materials:
  - 1. Use only those cleaning materials that will neither create hazards to health or property, damage surfaces, and are in compliance with Proposition 65.
  - 2. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
  - 3. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
  - 4. Use only environmentally acceptable "green" cleaning products.
- D. Remove temporary labels, tags and paper covering.

**1.3 REQUIREMENTS PREPARATORY TO FINAL ACCEPTANCE**

- A. Temporary facilities shall be removed from site.
- B. Plumbing, mechanical and electrical equipment shall operate quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent objectionable noise or vibration. Systems shall operate without humming, surging, or rapid cycling.
- C. Operating instructions for equipment shall be properly mounted and posted.
- D. Training: Provide training and orientation of Owner's operating staff in proper care and operation of equipment, systems and controls including:
  - 1. Fire protection systems.
  - 2. Plumbing equipment.
  - 3. HVAC equipment.
  - 4. Control systems.

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5. Fire alarm systems.
  6. Other systems as required in the specifications or needed to properly instruct Owner's representatives.
  7. Three copies of certificate, signed by the Owner's representative, attesting to their having been instructed.
- E. The following shall be submitted in accordance with Section 01 3300, Submittal Procedures.
1. Completed Record Drawings signed by Contractor and Inspector.
  2. Maintenance and Operating instructions and manuals.
  3. Certifications completed and signed.
  4. Guarantees and warranties as specified and required by the General Conditions.
- F. Contractor's Final Verified Report (Form DSA 6-C) and other Reports and Affidavits required by Division of State Architect shall be submitted; originals and one copy.
- G. Extra Stock shall be delivered and acknowledged by the Owner in quantities specified.

**1.4 PUNCH LIST**

- A. Prior to Architect's punch list, Contractor shall prepare and address initial deficiencies list for all work. Upon completion, this list shall be sent to the Architect.
- B. Contractor shall notify Architect when Contractor, with concurrence of Inspector, feels project is complete enough for preparation of Architect's punch list.
- C. Architect will then notify appropriate consultants including civil, mechanical and electrical engineers, landscape architect, food service designer and others as needed, to make their inspections and prepare "punch lists". Consultant "punch lists" will be completed before Architect will make its "punch list".
- D. Architect will prepare a "punch list".
- E. Punch lists will be published within 14 days of Architect's walk through.
- F. Work on the punch list, except minor items as determined by the Architect, shall be completed prior to completion and occupancy.

**1.5 FINAL ACCEPTANCE**

- A. After requirements preparatory to Final Acceptance have been completed as hereinbefore specified, Contractor shall notify Architect to perform acceptance tour. Notice shall be given at least three days in advance of the time the acceptance tour is to be performed.
- B. Contractor or its principal superintendents authorized to act in behalf of Contractor, shall accompany Architect and Inspector on acceptance tour, as well as any principal subcontractors that Architect may request to be present.

**CLOSEOUT PROCEDURES**  
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- C. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will recommend Final Acceptance to the Owner and initiate the filing of the Notice of Completion.
- D. If work has been substantially completed in accordance with Contract Documents, and only minor corrective measures are required, Architect will recommend that Owner conditionally accept Project and file Notice of Completion based upon Contractor's assurance that corrective measures will be completed within shortest practicable time period (but absolutely not later than 30 days).
- E. If work has not been substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend one or the other of the following:
  - 1. That Owner accept Project and file Notice of Completion only upon receiving from Contractor a Cashier's Check in amount sufficient to account for corrective measures still required, in the event that Owner had to have others complete the work.
  - 2. That Owner not accept project and not file Notice of Completion. Instead, based on information gathered from acceptance tour, Contractor will be required to complete all corrective measures and then call for another project acceptance tour following procedure outlined above.
- F. Should any corrective measures remain incomplete at time final payment is due, Contractor shall provide Owner with Money Order(s) or Cashier's Check in exchange for retention. Money Order(s) or Cashier's Check shall be in an amount one and one-half times the agreed estimated cost as determined by the Architect.
- G. Upon Final Acceptance of Project by Owner, Contractor shall submit his request for final payment, less retention. Retention payment will not be made by Owner until 35 days after board acceptance and filing of Notice of Completion with County Recorder, as specified in General Conditions.
- H. Retention payment will not be made until Contractor has filed the required Form DSA 6-C with DSA with two original copies to the Architect.

**1.6 CLOSEOUT CHECKLIST**

- A. The following items are to be fully completed and/or submitted as a condition for final acceptance of the project (as applicable)
  - 1. Specifications and Plans Review for Closeout
  - 2. Fire Alarm System Certification
  - 3. Megger Grounding Test Certificate
  - 4. Certificate of Compliance for Building Materials
  - 5. Contractor's Reuse, Recycling and Disposal Report
  - 6. Environmental Product Certification as required under Section 01 3543
  - 7. Indoor Air Quality Report (Section 01 3543)

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8. Certifications as required under Section 01 3300.
9. Air Balance Report
10. Operation & Maintenance Manuals
11. Guarantees/Warranties
12. Training
13. Record Drawings
14. Labels and name plates on all electrical panels
15. Keys (from Contractor - properly labeled):
  - a. electrical panel keys
  - b. communication panel keys
  - c. all cabinet keys
  - d. extra door keys as required by specifications
16. Punch List Items Completed
17. Extra Stock of Specified Items, delivered to Owner (including documents)
18. Back charges Resolved
19. Removal of Stop Notices
20. Contractor's Final Verified Reports (DSA 6-C)

**END OF SECTION**

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procedures.docx  
Last Updated: July 13, 2018*

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Requirements for explicit warranties, guarantees, bonds, and service and maintenance contracts specified in the individual Sections and supplementing the requirements included in the General Conditions.
  - 2. Guarantee and warranty period inspections.
  - 3. Forms for Guarantees/Warranties.

### **1.2 RELATED REQUIREMENTS**

- A. Section 01 3300, Submittal Procedures; additional requirements and submittal procedures for guarantees/warranties.

### **1.3 DEFINITIONS**

- A. General: The following definitions apply to the language used in these Specifications.
- B. Warranty: A representation or affirmative covenant that the work will be performed in accordance with certain standards stated in the Contract, such as in "a good and workmanlike manner," and otherwise be free of defects and in conformity with the Contract Documents for the duration noted or, if a duration is not indicated, the statute of limitations period for contract breaches will constitute the time frame for enforcement.
- C. Guarantee: A provision of the warranty which becomes operative after completion of the work under the Contract and requires replacement of defective or non-conforming materials or equipment, or remedy improper workmanship, at the guarantors own cost and expense, for the duration noted under the General Conditions of the Contract or in the Specifications.
- D. Standard Product Guarantees/Warranties: Preprinted written documents published by individual manufacturers for particular products and specifically endorsed by the manufacturer to the Owner.
- E. Contractor Standard Guarantee: The Contractor's guarantee for the term included in the General Conditions.
- F. Subcontractor Standard Guarantee: A Subcontractor's guarantee period that coincides with the term of the Contractor's guarantee included in the General Conditions.
- G. Special Guarantees/Warranties: Written guarantees/warranties required by or incorporated in the Contract Documents to be provided by the Contractor or its Subcontractors to either extend time limits of the Standard Guarantees/Warranties included in the General Conditions or to provide greater rights for the Owner.



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**1.4 GENERAL REQUIREMENTS**

- A. Guarantees/warranties between Contractor and manufacturers and between Contractor and suppliers shall not affect those issued to the Owner.
- B. Contractor shall not be held responsible for defects due to misuse, negligence, willful damage, improper maintenance, or accident caused by others nor shall it be responsible for damaged parts whose replacement is necessitated by failure of Owner's maintenance forces to properly clean and service them, provided that Contractor has furnished complete operating and maintenance instructions to Owner.
- C. By terms of each guarantee/warranty, unless otherwise specified or stipulated, also agree to remove and replace other work, as required, that has been connected to or superimposed on substrate material to be replaced.
- D. In addition to other requirements specified:
  - 1. Compile specified service and maintenance contracts.
  - 2. Coexecute submittals when specified.
  - 3. Review submittals to verify compliance with Contract Documents.
  - 4. Submit to Architect for review and transmittal to Owner.
- E. In case of items remaining incomplete after date of filing of the Notice of Completion, the guarantee/warranty period shall run from the date of acceptance of such items.
- F. Special guarantees/warranties applicable to definite parts of the Work and as specifically stipulated in the respective Sections of the Specifications or other Contract Documents shall be subject to the terms of this Section.
- G. If repairs or changes are required in connection with the work within a guarantee/warranty period, the Contractor shall, promptly upon receipt of notice from the Owner and without expense to the Owner, comply with the following:
  - 1. Correct defects and place in satisfactory condition the work covered by the respective guarantee/warranty.
  - 2. Repair, to the satisfaction of the Owner, damage to the Buildings and/or site that is the result of the cause for said repairs and changes.
  - 3. Repairs and corrective work shall be made to the satisfaction of the Owner including the equipment and contents of the Buildings and/or site disturbed during performance of the guarantee/warranty work.
- H. The Owner may, at its sole discretion, proceed with the correction work at Contractor's expense if Contractor does not proceed with the corrective work within a reasonable time fixed by a written notice from the Owner.
  - 1. As part of the corrective work, the Owner reserves the right to remove and store or dispose of defective equipment or material at Contractor's expense.
  - 2. If Contractor does not pay the costs of such removal and storage within ten days thereafter, the Owner may, upon ten additional days' written notice, sell such

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defective items and shall account for the net proceeds after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's additional services.

3. If the proceeds from the sale are insufficient to cover all amounts chargeable to Contractor, Contractor shall pay the difference to the Owner.
- I. If repairs or changes are required in connection with guarantee/warranty work and notice is given within the guarantee/warranty period, the warranty shall continue until the corrective work has been completed, regardless of the termination of the specified guarantee/warranty period.
- J. In case of work performed by subcontractors and where a special guarantee/warranty is required, guarantees/warranties addressed to and in favor of the Owner shall be secured from said subcontractors.
- K. No provision in the Contract Documents or in any special or general guarantee/warranty shall be held to limit, as to time or scope of liability, the Contractor's liability for defects or the liability of its sureties to less than the legal limit of liability under laws having jurisdiction.
- L. The delivery of any guarantees/warranties shall not relieve the Contractor from any obligation assumed under any other provision of the Contract Documents.
- M. The obligation of the Contractor under this Section shall survive the termination of the Contract.

**1.5 SUBMITTAL REQUIREMENTS**

- A. Assemble guarantees/warranties, bonds, and service and maintenance contracts executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Format:
  1. Size: 8-1/2-inch-by 11-inch sheets, punched for three-ring binder. Fold larger sheets to fit into binders.
  2. Binders: Commercial quality, three-ring, "View" type, with durable and cleanable plastic covers.
  3. Cover: Identify each packet with typed or printed title, "GUARANTEES/WARRANTIES," and list the title of Project and name of Contractor.
- C. Contents:
  1. Neatly typed, in orderly sequence.
  2. Provide complete information for each item including:
    - a. Product or work item.
    - b. Firm name with name of principal, address, and telephone number.
    - c. Beginning date and duration of warranty, bond, or service and maintenance contract.

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3. Provide the following information for Owner's personnel:
    - a. Proper procedure in case of failure.
    - b. Circumstances that might affect the validity of guarantee/warranty or bond.
  4. Contractor's name, name of responsible principal, address, and telephone number.
- D. Refer to Section 01 3300, Submittal Procedures, for additional requirements.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 TIME OF SUBMITTALS**

- A. Typical: Within 30 days after filing date of Notice of Completion.
- B. Equipment or component parts of equipment put into service during progress of construction; submit documents within 10 days after inspection and acceptance.
- C. Items of work, where acceptance is delayed materially beyond date of filing date of Notice of Completion; provide updated submittal within 14 days after acceptance, listing date of acceptance as start of guarantee/warranty period.

**3.2 GUARANTEE PERIOD INSPECTIONS**

- A. Contractor and subcontractors performing the construction work are required to guarantee workmanship and materials for the period noted in the Contract. Within a month of the end of such guarantee period, Contractor's agent shall prepare an inspection report indicating the condition of the Owner's facility and related common facility, itemizing the work to be completed, performed and/or corrected. Such guarantee period shall be continued in effect and extended until such time as Owner submits to Contractor written confirmation of the satisfactory completion of the itemized work, which confirmation shall be submitted within a reasonable period of time.

**3.3 GUARANTEE/WARRANTY FORMS**

- A. Contractor Standard Guarantee: Submit the following written Standard Guarantee/Warranty form for the overall Work against defects in materials and workmanship for the period of guarantee/warranty required under the Contract after the filing of the Notice of Completion (included with this section).
- B. Subcontractor Standard Guarantee: Submit the following written Standard Guarantee/Warranty form for Subcontracted Work against defects in materials and workmanship for the period of guarantee/warranty required under the Contract after the filing of the Notice of Completion (included with this section).
- C. Subcontractor Special or Extended Guarantee/Warranty: Contractor shall have its Subcontractor submit the following Special Extended Written Guarantee/Warranty, typed

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on Subcontractor's letterhead, when required by a Specification Section for a period in excess of 2 years (included with this section).

**END OF SECTION**

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*Last Updated: February 13, 2019*

*(Letterhead of Contractor)*

STANDARD GUARANTEE / WARRANTY

for

\_\_\_\_\_  
Project Name

\_\_\_\_\_  
Contract No.

We hereby warrant that the Work we have provided under the above reference Contract has been completed in accordance with the Drawings, Specifications, and other Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within the period of 24 months from the date of filing of the Notice of Completion of the above named Project by the Board of Trustees of the School District, and we also agree to repair any and all damages resulting from such defects, without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with above-mentioned guarantee conditions within ten (10) day after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Contractor) \_\_\_\_\_

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Printed Name of Authorized Representative)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

COUNTERSIGNED (Owner) \_\_\_\_\_

\_\_\_\_\_  
(Printed Name of Authorized Representative)

\_\_\_\_\_  
Signature

Date of Filing or Notice of Completion: \_\_\_\_\_

(Letterhead of Company)

SUBCONTRACTOR STANDARD GUARANTEE / WARRANTY

We hereby warrant that

\_\_\_\_\_

which we have provided in \_\_\_\_\_

for \_\_\_\_\_

Name of Project

District

has been completed in accordance with Specification Section \_\_\_\_\_ and requirements of the Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within a period of 24 months from date of filing the Notice of Completion of the above-named Project by the Board of Trustees of the School District without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with above-mentioned guarantee conditions within ten (10) day after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Subcontractor)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Company Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

COUNTERSIGNED (General Contractor)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Company Name)

\_\_\_\_\_

(Address)

\_\_\_\_\_

(License Number)

\_\_\_\_\_

(Date of Signing)

(Letterhead of Company)

SPECIAL EXTENDED WRITTEN GUARANTEE / WARRANTY

We hereby warrant that

\_\_\_\_\_

which we have provided in \_\_\_\_\_

\_\_\_\_\_  
Name of Project

for \_\_\_\_\_

\_\_\_\_\_  
District

has been completed in accordance with Specification Section \_\_\_\_\_ and requirements of the Contract Documents.

Under the terms of this warranty, we agree to repair or replace any or all of our work, together with any other adjacent work which may be displaced or damaged by so doing, which may prove to be either patently defective in its workmanship or latently defective in its workmanship or materials within a period of \_\_\_\_\_ year(s) from date of filing the Notice of Completion of the above-named Project by the Board of Trustees of the School District without any expense whatsoever to said Board of Trustees, ordinary wear and tear and unusual abuse or neglect excepted. We also agree to repair any and all damages resulting from such defects.

In the event of our failure to comply with above-mentioned conditions within a reasonable time but in no case longer than ten (10) calendar days after being notified in writing by the Owner, we collectively and separately do hereby authorize the Owner to have said defective work and damages repaired or replaced and made good at our expense and will honor and pay the costs and charges therefore upon demand.

SIGNED (Subcontractor)

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

COUNTERSIGNED (General Contractor)

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(License Number)

\_\_\_\_\_  
(Date of Signing)

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes general requirements and procedures for compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".

- 1. Chapter 5- Non-Residential Mandatory Measures.

### **1.2 RELATED REQUIREMENTS**

- A. Pertinent sections specifying erosion control.
- B. Section 01 3543, Environmental Procedures.
- C. Section 01 6116, Volatile Organic Compound (VOC) Restrictions.
- D. Section 01 7419, Construction Waste Management and Disposal.
- E. Section 01 7700, Closeout Procedures.
- F. Pertinent sections specifying landscape irrigation.

### **1.3 DEFINITIONS**

- A. CAL-Green Definitions: Certain terms are defined by CAL-Green in Chapter 5 of the code. Words and terms used in this section shall have the meanings shown therein.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Respond to questions and requests from Architect and the jurisdiction having authority regarding CAL-Green credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures. Document responses as informational submittals.

### **1.5 SUBMITTALS**

- A. CAL-GREEN Submittals: Submit CAL-GREEN submittals required by code and in other Specification Sections.
  - 1. CAL-GREEN submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CAL-GREEN requirements.
  - 2. Acceptable verification submittals are specified in the related sections.



**SUSTAINABLE DESIGN REQUIREMENTS**  
**SECTION 01 8113.10**  
**3431005**

**PART 2 - PRODUCTS**

**2.1 REQUIREMENTS - GENERAL**

- A. Provide products and procedures necessary to confirm CAL-GREEN compliance required in this Section. Although other Sections may specify some CAL-GREEN requirements, the Contractor shall determine additional materials, techniques, means, methods and procedures necessary to comply with CAL-GREEN requirements.

**2.2 CONSTRUCTION WASTE REDUCTION**

- A. Section 5.408 Construction Waste Management, Diversion and Recycling: Comply with requirements of this code section, local ordinances and Section 01 7419.

**2.3 BUILDING MAINTENANCE AND OPERATION**

- A. Section 5.410.2.5. Documentation and Training: Provide Operations Training as required by these code sections and as specified in Section 01 7700 and Systems Manual as specified in Section 01 7700.

**2.4 POLLUTANT CONTROL**

- A. Section 5.504.3 Indoor Air Quality: Comply with requirements of this code section, local ordinances and Section 01 3543.
  - 1. During storage, rough installation and until final start-up of HVAC equipment, securely cover all ducts and air distribution component openings with plastic, tape, sheet metal or other methods acceptable to enforcing agency to reduce dust or debris collected in the system.
- B. Section 5.504.4 Finish Material Pollutant Control: All Finish materials shall comply with requirements of this code section, local ordinances and Section 01 6116.

**PART 3 - EXECUTION**

**3.1 GENERAL**

- A. Comply with Section 01 7419, Construction Waste Management and Disposal.
- B. Comply with execution requirements of related sections and applicable local codes and ordinances.

**END OF SECTION**

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*Last Updated: April 8, 2019*

**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Rough carpentry.
- B. Related Sections:
  - 1. Section 01 35 42, CALGreen Requirements.

**1.02 REFERENCE STANDARDS**

- A. Conform to current adopted reference standards by date of issue of the current code cycle and the date of the Contract Documents.
- B. ASTM International:
  - 1. ASTM D 3498 - Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
  - 2. ASTM D 4601 - Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
  - 3. ASTM E 84 - Surface Burning Characteristics of Building Materials.
- C. CBC - California Building Code, 2022
- D. California Green Building Standards Code, CALGreen - 2022.
- E. DOC PS 1 - Department of Commerce Product Standard, U. S. Product Standard for Construction and Industrial Plywood.
- F. DOC PS 20 - Department of Commerce Product Standard, American Softwood Lumber Standards.
- G. DOC PS 2 - Department of Commerce Product Standard, U. S. Product Standard for Construction, Performance Standard for Wood-Based Structural-Use Panels.
- H. ANSI A135.4 - Basic Hardboard.
- I. WWPA - Western Lumber Grading Rules 88, Latest Edition, by Western Wood Products Association.
- J. HPVA HP-1 - American National Standard Institute, Hardwood Plywood and Veneer Association.
- K. APA - The Engineered Wood Association. The Construction Guide.

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- L. AWWA C1, C2, C3, C9, C27 - American Wood Preservers Association - Manual of Recommended Practice.
- M. AWWA C20 - American Wood Preservers Association Standards, Structural Lumber - Fire-Retardant Treatment by Pressure Process.
- N. WCLIB - West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.
- O. Title 8 - California Code of Regulations, Construction Safety Orders.
- P. ICC - ES - International Code Council Evaluation Service, Inc. Legacy Reports.
- Q. RIS - Redwood Inspection Service, Standard Specifications for Grades of California Redwood Lumber.
- R. Local AQMD - Local Air Quality Management District Regulations.

## 1.03 SUBMITTALS

- A. Product Data: For the following:
  - 1. Product Data and current ICC Legacy Reports.
- B. Material Certificates.
- C. CALGreen Submittals:
  - 1. Product Data Sheets and Declaration Statements showing compliance with CALGreen Code per 1.04.A.

## 1.04 QUALITY ASSURANCE

- A. California Green Building Standards Code, CALGreen - 2022.
  - 1. Adhesives, sealants, primers, and caulks shall comply with air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits, per CALGreen Tables 5.504.4.1 and 5.504.4.2.
  - 2. Paints and Coatings shall comply with VOC limits in Table 1 of the ARB, per CALGreen Table 5.504.4.3.
  - 3. Composite wood products (plywood, particle board, medium density fiberboard) shall comply with Formaldehyde limits per CALGreen Table 5.504.4.5.
- B. Rough Carpentry Lumber: Visible grade stamp on all products required.
- C. Grade Stamp: Association under whose rules it was graded, or official grade mark of other recognized grading agencies using grading rules, equivalent to WWPA or WCLIB.
- D. Association performing grading and grade marking of lumber shall be approved by Architect and Division of the State Architect.

- E. Nailing guns and nail operators shall be approved in accordance with Title 8 Construction Safety Orders.

## 1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver rough carpentry items until site conditions are adequate to receive the Work. Protect items from weather while in transit.
- B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raise above ground and out of contact with damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around stacks and under temporary covers. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.
- C. Install bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles materials, erection equipment or other loads are carried by frame during its erection.

## 1.06 FIELD CONDITIONS

- A. Cooperate with other trades in coordinating their Work with the Work of this Section. Provide wood grounds, blocking and nailer where indicated or as required for Work of other trades.

## PART 2 - PRODUCTS

### 2.01 ROUGH CARPENTRY MATERIALS

- A. Lumber: Graded in accordance with WWPA or WCLIB; maximum moisture content of 19 percent at time of installation. Provide Douglas Fir Larch for structural and framing lumber, surfaced four sides to standards of the grading association unless otherwise indicated on Drawings, use the following grades:
  - 1. Joists, rafters, beams, lintels, horizontal framing, posts, studs and vertical framing: No. 1 unless otherwise indicated or noted on drawings.
  - 2. Non-bearing studs and plates, non-structural furring, concealed blocking, stripping and miscellaneous nailers and backing: No. 2 unless noted otherwise in the structural drawings.
  - 3. Structural Drawings take precedence for lumber grades.
  - 4. All lumber in contact with concrete shall be pressure treated.
- B. Plywood: CBC Section 2303.3 and 2304.6, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification; Exposure 1 plywood grade. Thickness as indicated, span rating sized for spacing.

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1. For painted finish for interior and exterior: APA Sanded Plywood Panels, Panel Grade A-C, Group 1, Exterior plywood grade, sanded face, touch sanded back side.
  2. Exposure 1 plywood grade: "CDX", Structural I, C-D.
- C. Roof Plywood Decking: requiring FM 1-90 Wind and Fire Classification, minimum 1/2" thick. CBC Section 2304.8, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification: Exposure 1, B-C Veneer Grade, sanded 1 side. Thickness as indicated, span rating sized for spacing.
- D. Board Roof Decking: 2 x 6 Douglass Fir, kiln dry, #1 Grade Lumber, Tongue and Groove, surfaced one side.
- E. Preservative (Pressure) Treated Lumber: Section 2303.1.9 Conform to AWPAs Manual of Recommended Practice, kiln dry after treatment. Use preservative complying with AWPAs C2 lumber and C9 plywood, latest edition. Products NOT containing arsenic or chromium. Conform to AQMD, Local Regulations.
1. Douglas Fir Larch, used as required by Section 2303.1.9.1, CBC, shall conform to the following:
    - a. Lumber shall be WWPAs or WCLIB grade stamped.
    - b. Lumber shall be No. 1 grade or better unless indicated otherwise on Drawings.
- F. Plywood Backing Panels - Backboards:
1. Telephone and Electrical Equipment backboards, fixed equipment, cabinets, grab bars, door stops and plates: DOC PS 1, Exposure 1, APA A-C, sanded, Veneer Grade, fire-retardant treated, in thickness indicated or, if not indicated, not less than 5/8-inch nominal thickness. Installed "A" side out for paint finish.

## 2.02 ACCESSORIES

- A. Nails, Spikes and Staples: Section 2304.10 CBC, Galvanized for exterior applications, high humidity locations and treated wood; plain finish for other interior locations; size and type to suit application. Comply with Table 2304.10.1. Use common nails only.
- B. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.10 CBC, sized to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations. Full diameter body bolts only per ASME B18.2.1(.2) or B18.2.6 for structural applications.
- C. Soffit vents: Soffit Vents: Extruded aluminum material, 4-inch soffit vent unless otherwise noted on drawings. By Belmont, CA, Flannery, Inc., San Fernando, CA, Fry Reglet Company, Alhambra, CA, or equal.
- D. Expansion type or powder actuated type for anchorage to solid masonry or concrete.
1. Kwik Bolt TZ2 (KB-TZ2) Concrete Anchor, 3/8- to 3/4-inch diameter, ICC-ES ESR-4266, by Hilti Inc., Tulsa, OK. Or Strong-Bolt 2 concrete anchor, 1/2, 5/8, 3/4 and 1 inch diameter, ICC-ES ESR-3037, by Simpson Strong-Tie, Pleasanton, CA. Or equal with ICC Report Number.

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2. Kwik Bolt TZ2 (KB-TZ2) 1/4- to 3/4-inch diameter, ICC-ES ESR-4561, by Hilti. Or equal with ICC Report Number.
- E. Stock Framing Connectors: Section 2304.10 CBC types indicated on Drawings, galvanized, with nails fully driven in all holes in each face of connector. Conform to the following.
  1. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, United Steel Products, Montgomery, MN. or equal.
- F. Non-Stock Framing Connectors: Conform to details.
- G. Nonshrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time. Acceptable Manufacturers: Dayton Superior, Miamisburg, OH; Sonneborn, Shakopee, MN; Novex Systems International, Clifton NJ, or equal.
- H. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- I. Adhesives: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
  1. Adhesives shall comply with Local AQMD and California VOC Regulations.

## PART 3 - EXECUTION

### 3.01 LAYOUT MARKINGS

- A. Layout markings shall not be made with xylene-based inks, paint, or dyes, or with other solvent-based products that may bleed through finishes.

### 3.02 FRAMING, FURRING AND STRIPPING

- A. Erect wood framing, furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch in 10 feet, non-cumulative.
- B. Construct members of continuous pieces of longest possible lengths.
- C. Construct and erect required headers and lintels.
- D. Double wall framing members at openings over 100 square inches. Space short members above and below openings in same manner as for walls.
- E. Provide double joist headers at joist ends and around openings unless otherwise indicated on Drawings. Bridge joists and rafters to conform CBC Section 2306.1.1 and as noted on plans. For pre-manufactured joists, provide bridging in accordance with manufacturer's recommendations.

- F. Construct walls with studs of size and spacing indicated, 16 inches on center unless otherwise indicated on drawings. Install single sill member at bottom and double plate at top. Stagger upper and lower members of double plate with joints not less than 4 feet o.c. or as indicated on Drawings. Where sill or any wood member contacts concrete or masonry, install preservative-treated lumber.
- G. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at ceiling and floor lines and at spacing not to exceed 8 feet on center vertically. Fit snugly and attach with not less than two 16d nails.
- H. Install 3 studs at corners.
- I. Conform to CBC Section 2308.5.8, where pipes penetrate sills or plates.
- J. Cutting and Notching: Conform to CBC Section 2308.5.9.
- K. Bored Holes: Conform to CBC Section 2308.5.10.
- L. Conform to CBC Section 718 for fire blocks and draft stops. Fire blocks and stops at 10-foot intervals and at ceiling level.
- M. Fire-Retardant Wood: Ripping and milling are not permissible. Cross cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating. All cuts on plywood are considered end cuts and is permissible to be cut.

## 3.03 2 X ROOF DECKING

- A. Place floor decking] with end joints staggered. Secure boards over firm bearing. Maintain tight spacing between joints of boards. Place diagonal to framing members of rafters or joists.
- B. Maintain surface flatness of maximum 1/8 inch in 10 ft.
- C. Fit edges tight and secure with nails.

## 3.04 PLYWOOD SHEATHING

- A. Thickness as indicated on the Drawings, minimum thickness 1/2 inch.
- B. Boundary Nailing: Not less than 3/8 inch from edge, spaced not more than 6 inches on center, unless noted otherwise on Drawings.
- C. Blocking: Panel edges shall bear on framing members or solid blocking.
- D. Minimum Size Vertical Panel: 16 inches wide.
- E. Minimum Size Horizontal Panel: 24 inches wide.

- F. Oriented Strand Board not permitted for shear panels unless indicated on structural drawings.

## 3.05 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.

## 3.06 HORIZONTAL FRAMING

- A. Bearing: 1-1/2-inch minimum on wood or metal, 3 inches on masonry. Lay framing members with crown up. Members with knots at bottom not permitted.
- B. Lateral Support: Use solid blocking, cross bridging or other approved means.
- C. Lap joists a minimum of 3 inches when framed from opposite sides of a beam. Do not run joists continuous beyond one span unless indicated otherwise on Drawings.
- D. Openings: Double joists required for trimmer and headers for openings 4 ft. or larger unless indicated otherwise on Drawings.
- E. Provide ties, purlins and blocking in conformance with CBC Sections 2308.8.5.
- F. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

## END OF SECTION



## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Electric motors.
  - 2. Gauges.
  - 3. Access Doors.
  - 4. Flexible joints.
  - 5. Insulation.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 22 Section.

### **1.3 ADDITIONAL REQUIREMENTS**

- A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.
- C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

### **1.4 REFERENCES AND STANDARDS**

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. CSA – Canadian Standards Association International.
  - 2. ANSI - American National Standards Institute.
  - 3. ASTM - American Society for Testing and Materials.
  - 4. CCR - California Code of Regulations.
    - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
  - 5. NCPWB - National Certified Pipe Welding Bureau.
  - 6. CEC - California Electrical Code.
  - 7. NEMA - National Electrical Manufacturers' Association.

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8. NFPA - National Fire Protection Association.
9. OSHA - Occupational Safety and Health Act.
10. UL - Underwriters' Laboratories, Inc.

**B. Requirements of Regulatory Agencies:**

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
  - a. California Building Code, 2022.
  - b. California Electrical Code, 2022.
  - c. California Energy Code, 2022.
  - d. California Fire Code, 2022.
  - e. California Green Building Standards Code, 2022.
  - f. California Mechanical Code, 2022.
  - g. California Plumbing Code, 2022.
  - h. California Code of Regulations, Title 24.
  - i. California Health and Safety Code.
  - j. CAL-OSHA.
  - k. California State Fire Marshal, Title 19 CCR.
  - l. National Fire Protection Association.
  - m. Occupational Safety and Health Administration.
  - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

**1.5 DRAWINGS**

- A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
  1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
  2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations

- shown. Obtain the Architects approval prior to relocation of equipment and materials.
3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

## **1.6 FEES AND PERMITS**

- A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.
- C. Coordination:
1. General:
    - a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

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- 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
3. Mechanical Coordination:
  - a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
  - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
  - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
  - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

**1.7 SUBMITTALS - GENERAL**

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
  6. Organize submittals in same sequence as in Specification Sections.
  7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation

- and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
- a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
  - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
  - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

## **1.8 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
  1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
  2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.

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- D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 6875. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 6875.
- E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
  - 1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
  - 2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
  - 3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
    - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient  $I_p = 1.5$  shall be used for gas piping bracing calculations.
    - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2019 California Building Code
  - 4. Additional Requirements: In addition to the above, conform to all state and local requirements.

**1.9 INFORMATIONAL SUBMITTALS**

- A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 8000. Comply with requirements for layouts specified in Section 23 8000.

**1.10 CLOSEOUT SUBMITTALS**

**A. Operation and Maintenance Data:**

1. Refer to Division 01 for complete instructions.
2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
    - 6) Copies of guarantees/warranties for each item of equipment and systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Control diagrams and literature.
    - 11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
    - 12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
    - 13) Commissioning and Preliminary Operation Tests required as part of the Work.
  - b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

**B. Record Drawings:**

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.

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- b. One complete set of reproducible drawings showing the Work exactly as installed.
- c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
- d. Provide Contractor's signature, verifying accuracy of record drawings.
- e. Obtain the signature of the Project Inspector for all record drawings.

**1.11 SUBSTITUTIONS**

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  - 1. Reason for substitution request.
  - 2. Complete submittal information as described herein; see "Submittals."
  - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  - 5. Explanation of impact on connected utilities.
  - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.
- G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

**1.12 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.



- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.
- C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 6875.
- D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.
- E. All materials and products shall be new and shall match existing.

**1.13 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

**1.14 FIELD CONDITIONS**

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

**1.15 WARRANTY**

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

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**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

**2.2 MATERIALS AND PRODUCTS**

- A. No material installed as part of this Work shall contain asbestos.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

**2.3 GAUGES**

- A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

**2.4 ACCESS DOORS**

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  - 1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.

- E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  - 1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## **2.5 EQUIPMENT IDENTIFICATION**

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## **2.6 PIPE IDENTIFICATION**

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

## **2.7 INSULATION WORK**

- A. General:
  - 1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
  - 2. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
  - 3. The term "piping" used herein includes pipe, valves, strainers and fittings.
  - 4. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - 5. Provide pre-formed PVC valve and fitting covers.
  - 6. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
  - 7. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

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8. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
9. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

**B. Insulation of Piping:**

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
  - a. Pipe 3/4 inches and smaller: 1 inch thick.
  - b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
  - c. Pipe 2 inches and larger: 2 inches thick.
2. Insulate domestic hot water piping under slab on grade and cold water piping exposed to the weather with 3/4 inch thick Therma-Cel, Armaflex, or equal; seal water tight per manufacturer's directions.
3. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
4. Insulate domestic cold water piping outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
5. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
7. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
  - a. Fitting covers:
    - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 2) Tee covers.

- 3) Flange and union covers.
- 4) End caps.
- 5) Beveled collars.
- 6) Valve covers.
- 7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- b. Jacket thickness:
  - 1) Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
  - 2) Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

### **PART 3 - EXECUTION**

#### **3.1 EXISTING MATERIALS**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.
- D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

#### **3.2 FRAMING, CUTTING AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.

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- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

**3.3 PLUMBING DEMOLITION**

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
  - 3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

**3.4 ELECTRICAL REQUIREMENTS**

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### **3.5 PIPING SYSTEM REQUIREMENTS**

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

### **3.6 PRIMING AND PAINTING**

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and Painting:
  - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
    - a. Black Steel Piping:
      - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
      - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
  - 3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

### **3.7 EXCAVATING**

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for

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pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.

- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

**3.8 BACKFILLING**

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

**3.9 PIPING SYSTEMS INSTALLATION**

- A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.



**B. General:**

1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
3. Install piping to permit application of insulation and to allow valve servicing.
4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

**C. Floor, Wall, and Ceiling Plates:**

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1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

**D. Firestopping:**

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

**E. Flashing:**

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

**F. Hangers and Supports:**

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.
  - a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
    - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Note 3)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

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- 1) Note 1: Provide mid-story guides.
  - 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
  - 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.
- c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
  - 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
  - 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.
- d. Horizontal cast iron piping support spacing:
- 1) Support piping at every other joint for piping length of less than 4 feet.
  - 2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
  - 3) Hanger shall not be installed on the coupling.
  - 4) Provide support at each horizontal branch connection.
  - 5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
  - 6) Provide a brace on each side of a change in direction of 90 degrees or more.

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5. Suspended Piping:

- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Steel Connectors: Beam clamps with retainers.

6. Support to Structure:

- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
- 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062      MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through

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- 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
7. Rubber Neoprene Pipe Isolators:
- a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

**3.10 UNION AND FLANGE INSTALLATION**

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 6875.
- B. Install unions in piping NPS 2" and smaller, and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 6875.
- C. Locate the unions for easy removal of the equipment, tank, or valve.

**3.11 ACCESS DOOR INSTALLATION**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers,

traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### **3.12 CONCRETE WORK**

- A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.
- B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

### **3.13 PIPE PROTECTION**

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  - 1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
  - 2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  - 1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.

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- E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.
- F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer's recommendations and instructions.
- G. Sleeve cast iron and ductile iron pipe below grade and below slab with "Polywrap" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer's recommendations and instructions.
- H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

**3.14 PIPE IDENTIFICATION**

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Apply markings after painting and cleaning of piping and insulation is completed.

**3.15 EXPANSION ANCHORS IN HARDENED CONCRETE**

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.



- D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

### **3.16 PIPING SYSTEM PRESSURE TESTING**

- A. General:
  - 1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
  - 2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:
  - 1. Authority having jurisdiction shall witness tests of piping systems.
  - 2. Notify Architect at least seven days in advance of testing.
  - 3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
  - 4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
  - 5. Isolate from system equipment that may be damaged by test pressure.
  - 6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
    - a. Authority having jurisdiction shall witness final connection to system.
- C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.
- D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

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<u>System Tested</u>	<u>Test Pressure PSI</u>	<u>Test With</u>
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Natural Gas (PE)	60	Air & Non-corrosive Leak Test Fluid
Natural Gas (Steel)	100	Air & Non-corrosive Leak Test Fluid
Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

1. Flush deionized water lines with deionized water after test and approval.
2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

**3.17 OPERATION OF SYSTEMS**

- A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
  1. Complete all requirements listed under "Check, Test and Start Requirements."
  2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  3. Filters, strainers etc. are in place.
  4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

**3.18 CHECK, TEST AND START REQUIREMENTS**

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.

1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

### **3.19 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS**

- A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
  2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Missing or damaged parts have been replaced.
  7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  10. Preliminary test and balance work is complete, and reports have been forwarded for review.
  11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.

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12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- D. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- E. Preliminary Operation:
1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

**3.20 CERTIFICATES OF INSTALLATION**

- A. Contractor shall complete applicable "Certificates of Installation" forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

**3.21 DEMONSTRATION AND TRAINING**

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

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1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
  - a. Listing of Owner-designated personnel completing training, by name and title.
  - b. Name and title of training instructor.
  - c. Date(s) of training.
  - d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Pipe and fittings.
  - 2. Valves.
  - 3. Domestic water piping specialties.
  - 4. Gas piping specialties.
  - 5. Drain and waste piping specialties.

**1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 0050 Basic Plumbing Materials and Methods.

**1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

**1.4 INFORMATIONAL SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Provide welding certificate for all gas pipe welders.
- C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

**1.5 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

**1.6 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

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**1.7 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.
- C. NFPA/ANSI Compliance: Fabricate and install natural gas systems in accordance with latest edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."
- D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- E. Fabricate and install natural gas systems in accordance with California Plumbing Code.
- F. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

**PART 2 - PRODUCTS**

**2.1 MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

**2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS**

- A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.
- B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.
  - 1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at

each floor and at 15 foot maximum intervals (also see Specification Section 22 0050).

- C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.
1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
  2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.
- D. Vent Pipe:
1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
  2. 2-1/2 inch and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
  3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.
- E. Type DWV copper tubing or No-Hub cast iron pipe and fittings may be used for concealed rainwater leaders. Where no-hub piping is used, the fittings and couplings shall match those used for waste piping.
- F. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 0050 for pipe protection requirements for below slab copper piping.
- G. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.
- H. Gas Pipe: Schedule 40 black steel conforming to ASTM A53, with malleable iron threaded fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.
1. Appliance Flexible Connectors for Indoor Equipment Without External Spring Isolation:
    - a. Contractor may choose one of the following:



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- 1) Direct gas pipe connection.
- 2) Appliance flexible connector:
  - a) Comply with ANSI Z21.24.
  - b) Polymer or hot-dipped PVC coated corrugated 304 stainless steel.
  - c) Operating-Pressure Rating: 0.5 psig.
  - d) End Fittings: Zinc-coated steel.
  - e) Maximum Length: 30 inches.
  - f) Manufacturers: Dormont, Series 30C, 31, 40C, 41, and 51, Brasscraft model ProCoat, or equal.
- b. Provide with end connections compatible with equipment and piping system.
- c. Equipment located in spaces normally accessible to building occupants, other than maintenance personnel, shall utilize direct gas pipe connection.

#### **I. Condensate Drain Piping:**

1. Inside buildings provide ASTM B88, Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.
2. Outside buildings provide ASTM B88, Type L copper pipe and fittings, cast iron drain pipe and fittings or Schedule 40 galvanized steel pipe and cast iron drain or vent fittings.
3. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
4. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide threaded metal connector at mechanical equipment, Metraflex Model SST, or equal by Unisource Mfg. Co., or Flexicraft Industries. Arrange flexible connection to ensure drainage of condensate, and support flexible connection at each end of connector, to ensure proper alignment.
5. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.
6. Provide cleanout tees or "Y" at each change in direction.

## **2.3 PIPE JOINING MATERIALS**

- A. Refer to piping Articles in this Section for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated

- a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.
- b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
- 2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless other indicated.
- 3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
- 4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.
- D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
- E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## **2.4 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS**

- A. General:
  - 1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 6875.
    - a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.
      - 1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 6875.
- B. Gate Valves:
  - 1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
  - 2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
  - 3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
  - 4. Main distribution gate valves underground outside building above 1-1/2 inches:
    - a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
      - 1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
      - 2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.

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#### **C. Ball Valves:**

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

#### **D. Calibrated Balancing Valves:**

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating pressure.
  - a. Body: Brass.
  - b. Ball: 304 Stainless Steel.
  - c. Seat: Glass and Carbon filled TFE.
  - d. End Connections: Threaded.
  - e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
  - f. Handle Style: Dial, with memory stops to retain set position.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. 1 inch and smaller: Bell & Gossett model CB, "LF" series.

## **2.5 VALVES AND FITTINGS FOR GAS SYSTEMS**

#### **A. Gate Valves:**

1. 2-1/2 inches and smaller: Class150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.

#### **B. Gas Shut-off Valve Above Grade:**

1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.

## **2.6 DOMESTIC WATER PIPING SPECIALTIES**

#### **A. Hose Bibbs:**

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1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
    - a. Acorn Engineering Co.
    - b. Woodford Manufacturing Co.
  2. Hose Station: Leonard THS-25-VB-CW, Symmons, or equal.
- B. Wall Hydrants:
1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
    - a. Acorn Engineering Co.
    - b. Woodford Manufacturing Co.
    - c. Mifab, Inc.
- C. Water Hammer Arrestors:
1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 6875, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
  2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
  3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.
  4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Josam Company, series 75000.
    - b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
    - c. Mifab, series WHB.
- D. Thermostatic Water Temperature Control Valve:
1. Provide thermostatic water temperature control valve conforming to lead free requirements of California Health and Safety Code Section 11 6875, with size as noted on Drawings, complete with union angle strainer checkstops. Valves shall be thermostatic type, with a maximum temperature setting as follows:
  2. Provide surface semi-recessed mounted, stainless steel cabinet with locking door for control valves. Including:
    - a. Control valve cabinet and valve shall be provided as a package, and include thermostatic water mixing valve, thermometer, safety checkstops, volume control valve and internal piping.

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3. Where indicated on drawings, provide a temperature alarm system, utilizing a micro-processor based controller and solid state temperature controller. Provide audible and visual indication of high and low temperature set points. Provide required hardware and wiring for a complete operating system.
  - a. Provide isolation transformer for control of the alarm system.
  - b. Provide solenoid valve and shock absorber, installed and wired to the alarm module.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Leonard Valve Company.
  - b. Lawler Manufacturing Co., Inc.
  - c. Powers.

#### **E. Relief Valves:**

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Watts Regulator Company.
  - b. Cash (A.W.) Valve Manufacturing Corporation.
  - c. Zurn Industries, Inc.; Wilkins-Regulator Division.

## **2.7 DRAIN AND WASTE PIPING SPECIALTIES**

#### **A. Cleanouts:**

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
  - a. Provide cleanouts in waste drop from each sink and urinal.
  - b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.
2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.

3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.
  - a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
  - b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

**B. Floor Drains:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

**C. Floor Sinks:**

1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

**D. Hopper Drains:**

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Zurn.
  - b. J.R. Smith.

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.
- B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.
- C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.
- D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

**3.2 INSTALLATION OF WATER PIPING**

- A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.
- B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
  - 1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
  - 2. Install water hammer arresters above accessible ceilings, or install access doors for service.
- C. In freezing locations arrange water piping to drain as shown.
- D. Install piping on room side of building insulation.
- E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

**3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS**

- A. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved.

Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.

- B. Storm Drain Piping: Run all horizontal storm drain piping inside of building on a uniform grade of not less than 1/4 inch per foot. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.
- C. Install rainwater leader nozzles at exposed bottom of leaders where they spill onto grade.
- D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.
- E. Grade all vent piping so as to free itself quickly of any water condensation.
- F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.
- G. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.
- H. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

#### **3.4 INSTALLATION OF NATURAL GAS PIPING**

- A. Install natural gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.
- B. Use sealants on metal gas piping threads that are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.
- D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.
- E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.
- F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.
- G. Install drip-legs in gas piping where indicated and where required by code or regulation.
  - 1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.
  - 2. Where gas supply is connected to equipment with flexible connectors, install drip-leg in piping on downstream side of flexible connector, and install shut off valve on piping on upstream side of flexible connector.
- H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.



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- I. Install piping parallel to other piping.
- J. Paint all gas piping installed in exposed exterior locations. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods, article, Painting.
- K. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: "Gas Shut-Off." Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.
- L. Provide watertight Schedule 40 PVC conduit to protect gas piping installed below covered walk, covered driveways, and where noted on Drawings. Extend sleeve at least 12 inches beyond any area where it is required to be installed, and terminate with valve box extended to grade, and marked "GAS".

### **3.5 PIPE JOINTS AND CONNECTIONS**

- A. General:
  - 1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
  - 3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
- B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- D. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
  - 1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.
- E. Cast Iron Soil Pipe:
  - 1. No-Hub fittings shall be made with a torque wrench.
  - 2. Hub joints shall be with Ty-Seal couplings.

3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.

F. Welded Pipe:

1. Make up with oxyacetylene or electric arc process.
2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Threadolets, Nibco, or equal, may be used in lieu of welding tees.

### **3.6 INSTALLATION OF VALVES**

A. Install valves as indicated on Drawings and in the following locations:

1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph "Butterfly Valves" may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph "Ball Valves" may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:

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- a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
  - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- D. Silent Check Valves: Install in horizontal or vertical position between flanges.
- E. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers' recommendations, including requirements for straight pipe lengths at valve inlet and outlet.
- F. Gas Shut-Off Valves:
  - 1. Provide line size ball valve in gas line to each appliance.
- G. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### **3.7 INSTALLATION OF CLEANOUTS**

- A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

### **3.8 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS**

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.

### **3.9 EQUIPMENT CONNECTIONS**

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

### **3.10 DOMESTIC WATER SYSTEM STERILIZATION**

- A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.

1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

**3.11 CARE AND CLEANING**

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

**3.12 OPERATIONAL TESTS**

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

**3.13 TESTING AND BALANCING**

- A. See Section 23 0593 of Specifications for testing and balancing requirements.

**3.14 CLEANING UP**

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Water supplies and stops.
  - 2. Plumbing fixture hangers and supports.

**1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 0050 Basic Plumbing Materials and Methods.

**1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Refer to Section 22 0050, Basic Plumbing Materials and Methods.

**1.5 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

**1.6 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 0050, Basic Plumbing Materials and Methods.
- B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:
  - 1. California Building Code – CBC
  - 2. California Plumbing Code – CPC
  - 3. California Health and Safety Code
  - 4. American National Standards Institute - ANSI
  - 5. Federal Standards - F.S.

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- 6. National Sanitary Foundation – NSF International
- C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”
- D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.
- E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.
- F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.
- G. Americans with Disabilities Act (ADA).
- H. California Green Building Standards Code Requirements:
  - 1. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

**PART 2 - PRODUCTS**

**2.1 PLUMBING FIXTURES**

- A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.
  - 1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
  - 2. Take location and mounting heights for roughing-in from Architectural Drawings.
  - 3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
  - 4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

**2.2 MATERIALS**

- A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
- B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.

- C. Handles on all faucets and stops shall be all metal chromium plated.
- D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

### **2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES**

- A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
  - 1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.
- B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.
- C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.
- D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.
- F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.
- G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

### **2.4 MANUFACTURERS**

- A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.
- B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:
  - 1. Vitrified China Plumbing Fixtures:
    - a. American Standard, U.S. Plumbing Products.
    - b. Eljer Plumbingware Div., Wallace-Murray Corp.
    - c. Kohler Co.
    - d. VitrA.

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**2.5      FIXTURE CONNECTIONS**

- A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.
- B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Dearborn Brass, Commercial series with brass nuts.
    - b. Delta Commercial.
    - c. McGuire Manufacturing Co., Inc.
- C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.
- D. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

**2.6      WATER SUPPLIES AND STOPS**

- A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 6875, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.
- B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.
- C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.
- D. Provide cast brass escutcheon.
- E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. McGuire Manufacturing Company, Inc., model LFH2167LK.
  - 2. T & S Brass and Bronze Works, Inc., model B-1305.



## **2.7 PLUMBING FIXTURES**

- A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.
- B. Special Requirements For Accessible Fixtures:
  - 1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
  - 2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded "closed-cell" vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

## **PART 3 - EXECUTION**

### **3.1 PRODUCT HANDLING AND PROTECTION**

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

### **3.2 PREPARATORY PROVISIONS**

- A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

### **3.3 INSPECTION AND PREPARATION**

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.

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- D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.
- E. Refer to Division 26 for wiring for electronic flush valves.

#### **3.4 FAUCET INSTALLATION**

- A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 11 6875, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.
- B. Adjust metering faucets to run for 10 to 15 seconds.

#### **3.5 CLEAN AND PROTECT**

- A. Clean plumbing fixtures of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.
- C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

#### **3.6 FIELD QUALITY CONTROL**

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

#### **3.7 EXTRA STOCK**

- A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Electric motors.
  - 2. Motor starters.
  - 3. Access Doors.
  - 4. Expansion loops.
  - 5. Flexible joints.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 23 Section.
- C. Refer to Section 23 0800.13, T-24 Commissioning of HVAC for Title 24 commissioning requirements.

### **1.3 ADDITIONAL REQUIREMENTS**

- A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.
- C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

### **1.4 REFERENCES AND STANDARDS**

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. AABC - Associated Air Balance Council
  - 2. AFBMA - Anti Friction Bearing Manufacturer's Association
  - 3. AMCA - Air Moving and Control Association Inc.
    - a. Standard 210 - Laboratory Methods of Testing Fans
  - 4. ANSI - American National Standards Institute
  - 5. ARI - Air-Conditioning and Refrigeration Institute

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6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME - American Society of Mechanical Engineers
8. ASTM - American Society for Testing and Materials
9. CCR - California Code of Regulations
  - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
10. CSA – Canadian Standards Association International
11. CSFM - California State Fire Marshal
12. NCPWB - National Certified Pipe Welding Bureau
13. NIST - National Institute of Standards and Technology
14. NEMA - National Electrical Manufacturers' Association
15. NFPA - National Fire Protection Association
16. OSHA - Occupational Safety and Health Act
17. SMACNA - Duct Manuals
18. UL - Underwriters' Laboratories, Inc.

**B. Requirements of Regulatory Agencies:**

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
  - a. California Building Code, 2022.
  - b. California Electrical Code, 2022.
  - c. California Energy Code, 2022.
  - d. California Fire Code, 2022.
  - e. California Green Building Standards Code, 2022.
  - f. California Mechanical Code, 2022.
  - g. California Plumbing Code, 2022.
  - h. California Code of Regulations, Title 24.
  - i. California Health and Safety Code.
  - j. CAL-OSHA.
  - k. California State Fire Marshal, Title 19 CCR.
  - l. National Fire Protection Association.
  - m. Occupational Safety and Health Administration.
  - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

**1.5 DRAWINGS**

- A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.

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- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
  2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
  3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

**1.6 FEES AND PERMITS**

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
- C. Coordination:
1. General:
    - a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
  3. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:

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- 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
  - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
  - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
4. Mechanical Coordination:
- a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
  - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
  - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
  - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

**1.7 SUBMITTALS - GENERAL**

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.

6. Organize submittals in same sequence as in Specification Sections.
7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
  - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
  - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
  - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.
  1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

## **1.8 ACTION SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

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1. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
3. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
  - a. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.
  - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2019 California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

**1.9 INFORMATIONAL SUBMITTALS**

- A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 8000.
- B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.
- C. Check, Test, and Start forms, from equipment manufacturers.
- D. Check, Test and Start reports.

**1.10 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:



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1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
    - 6) Copies of guarantees/warranties for each item of equipment or systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Temperature control diagrams and literature.
    - 11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
    - 12) Commissioning and Preliminary Operation Tests required as part of the Work.
2. Post service telephone numbers and addresses in an appropriate place designated by Architect.

**B. Record Drawings:**

1. Refer to Division 01 for additional requirements.
2. Upon completion of the Work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.
  - b. One complete set of reproducible drawings showing the Work exactly as installed.
  - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
  - d. Provide Contractor's signature, verifying accuracy of record drawings.
  - e. Obtain the signature of the Inspector of Record for Record Drawings.

**1.11 SUBSTITUTIONS**

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.

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- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  - 1. Reason for substitution request.
  - 2. Complete submittal information as described herein; see "Submittals."
  - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  - 5. Explanation of impact on connected utilities.
  - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.
- G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

**1.12 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.
- C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.
- D. All materials and products shall be new.

**1.13 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

**1.14 FIELD CONDITIONS**

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

**1.15 WARRANTY**

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum,.
- C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

**2.2 MATERIALS**

- A. No material installed as part of this Work shall contain asbestos.
- B. California Green Building Code Compliance:
  - 1. HVAC and refrigeration equipment shall not contain CFCs.
  - 2. HVAC and refrigeration equipment shall not contain Halons.

**2.3 ELECTRIC MOTORS**

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. U.S. Motors.
  - b. Century Electric.
  - c. General Electric.
  - d. Lincoln.
  - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
  1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
  1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
  2. Motors Used with Variable Frequency Controllers:
    - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
    - c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
    - f. Each motor shall be provided with a shaft grounding device for stray current protection.

3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split phase.
  - c. Capacitor start, inductor run.
  - d. Capacitor start, capacitor run.
3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:
  - a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.
    - 1) Exceptions:
      - a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
      - b) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.
4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
7. Motors 1/20 HP and Smaller: Shaded-pole type.
8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

## **2.4 MOTOR STARTERS**

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
  1. All starters shall have the following:
    - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.

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- b. Ambient compensated thermal overload.
  - c. Fused control transformer (for 120 or 24 volt service).
  - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

**2.5 ACCESS DOORS**

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.
- E. Provide insulated doors where located in internally insulated ducts or casings.
- F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## **2.6 THERMAL AND SEISMIC EXPANSION LOOPS**

- A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend. Return bend section shall have support lug and plugged FPT drain. Flexible hose shall consist of corrugated metal inner hose and braided metal outer sheath. Assemblies shall be constructed from materials compatible with the fluid or gas being conveyed and shall be suitable for the system operating pressure and temperature. Provide assembly selected for 4 inches of movement.
- B. Assembly shall be suitable for use with R-410A refrigerant. Provide assembly without drain, cleaned, capped, and labeled for specific use.
- C. Basis-of-Design Product: Subject to compliance with requirements, provide Metraflex Inc., Metraloop series, or comparable product by one of the following, or equal:
  - 1. Flexicraft Industries.

## **2.7 FLEXIBLE JOINTS**

- A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.
- B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

## **2.8 PIPE GUIDES**

- A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

## **2.9 EQUIPMENT IDENTIFICATION**

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## **2.10 PIPE IDENTIFICATION**

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legend and flow arrow shall conform to ASME A13.1.

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**PART 3 - EXECUTION**

**3.1 EXISTING MATERIALS:**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

**3.2 FRAMING, CUTTING, AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

**3.3 MECHANICAL DEMOLITION**

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.



3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
  4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### **3.4 ELECTRICAL REQUIREMENTS**

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### **3.5 PIPING SYSTEM REQUIREMENTS**

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

### **3.6 PRIMING AND PAINTING**

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. Priming and painting:
  1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.

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- a. Black Steel Piping:
  - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

**3.7 EXCAVATING**

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.
- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

### **3.8 BACKFILLING**

- A. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- B. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- C. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

### **3.9 PIPING AND DUCT SYSTEMS INSTALLATION**

- A. General:
  - 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
  - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
  - 3. Install piping to permit application of insulation and to allow valve servicing.
  - 4. Where piping, conduit, or ductwork is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
  - 5. Horizontal runs of pipes, conduits, or ductwork suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
  - 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
  - 7. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component opening shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency.
  - 8. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
  - 9. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
  - 10. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
  - 11. Install horizontal valves with valve stem above horizontal.

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12. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
13. Verify final equipment locations for roughing-in.
14. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
15. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

**B. Expansion Loops:**

1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
2. Install expansion loops of sizes matching sizes of connected piping.
3. Install grooved-joint expansion joints to grooved-end steel piping.
4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.

**C. Sleeves:**

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

**D. Floor, Wall, and Ceiling Plates:**

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

**E. Firestopping:**

1. Pack the annular space between the pipe sleeves and the pipe and between duct openings and ducts through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or

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floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with CBC requirements.

3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Firestopping systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

**F. Flashing:**

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues, ducts, and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Elmdor/Stoneman Model 1540.
  - c. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4.

**G. Hangers and Supports:**

1. General: Support ductwork, equipment and piping so that it is firmly held in place by approved iron hangers and supports, and special hangers. Hanger and support components shall support weight of ductwork, equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping or ductwork with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping and ductwork support spacing, provide

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“bridging” support members firmly attached to building structural members in a fashion approved by the structural engineer.

- a. Materials, design, and type numbers for support of piping per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
  - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
- b. Materials and design for ductwork support shall be per SMACNA “HVAC Duct Construction Standards, Metal and Flexible.”
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Copper Brazed or Soldered (Notes 3, 4)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

- 1) Note 1: Provide mid-story guides.
- 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 4) Note 4: Includes refrigerant piping, including vapor and hot gas pipes.
- b. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

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<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Copper Brazed or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.

5. Suspended Piping:

- a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Provide 3/8 inch rod for support of PVC and CPVC and provide continuous support.
- c. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturers' published load ratings. No deflection to exceed 1/180 of a span.
- d. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
- e. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.

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- f. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
- g. Above Roof: H frame made from Uni-Strut hot-dipped galvanized 1-5/8 inch single or double channel with P-2072A or P-2073A foot secured to roof and surrounded with waterproof roofed-in sleeper. Secure to sleeper with lag screws, and secure sleeper to blocking under roof.
- h. Steel Connectors: Beam clamps with retainers.
- 6. Duct Hanger and Support Spacing: Conform to Requirements of CMC and SMACNA "HVAC Duct Construction Standards, Metal and Flexible."
- 7. Support to Structure:
  - a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
    - 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062      MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
- 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
- b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.
- 8. Rubber Neoprene Pipe Isolators:
  - a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.



9. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
10. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
11. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
12. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
13. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.
14. On chilled or combination hot and chilled water or refrigerant pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.

### **3.10 UNION AND FLANGE INSTALLATION**

- A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.
- B. Install unions in piping NPS 2" and smaller 3 or flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.
- C. Locate the unions for easy removal of the equipment, tank, or valve.
- D. Do not install unions or flanges in refrigerant piping systems.

### **3.11 ACCESS DOOR INSTALLATION**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### **3.12 PIPE PROTECTION**

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.

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2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. holiday detector, or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

**3.13 PIPE IDENTIFICATION**

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
  1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.
- E. Apply the markings after painting and cleaning of piping and insulation is completed.

**3.14 TRACER WIRE INSTALLATION**

- A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.
- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.

**3.15 OPERATION OF SYSTEMS**

- A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
  - 1. Complete all requirements listed under "Check, Test and Start Requirements."
  - 2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  - 3. Filters, strainers etc. are in place.
  - 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  - 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.
- C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

**3.16 CHECK, TEST AND START REQUIREMENTS**

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
  - 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  - 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.

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3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

**3.17 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS**

- A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
  2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Damaged fins on heat exchangers have been combed out.
  7. Missing or damaged parts have been replaced.
  8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  11. Preliminary test and balance work is complete, and reports have been forwarded for review.
  12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
  13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

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1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
  3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Before handing over the system to Owner replace all filters with complete new set of filters.
- D. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- E. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- F. Preliminary Operation:
1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.
- G. Operational Tests:
1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
  2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
  3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
  4. Control systems shall be completely operable with settings properly calibrated and adjusted.

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5. Rotating equipment shall be in dynamic balance and alignment.
6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

H. Pre-Occupancy Building Purge:

1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.
2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

**3.18 DEMONSTRATION AND TRAINING**

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
  2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
    - a. Listing of Owner-designated personnel completing training, by name and title.
    - b. Name and title of training instructor.
    - c. Date(s) of training.
    - d. List of topics covered in training sessions.
  4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 PROJECT STANDARDS**

- A. Become familiar with the general layout of the facility. Provide the Engineer with a written report including hours worked, work accomplished, and work to be completed on the next shift. All reports shall be submitted at shift end to the Engineer.

### **1.2 PRE-PROJECT REPORT**

- A. Submit a pre-project document including findings and recommendations for cleaning of all air delivery system services. Provide photographic evidence of conditions found in duct work, components, and air handlers including lab reports. See Article 3.02 of this Section for establishment of existing contamination levels.

### **1.3 QUALITY ASSURANCE**

- A. Inspection, contamination evaluation, hygienic maintenance service, and monitoring probe installation shall be performed by a supervisor with a minimum of two (2) years experience in projects of equal or greater scope.
- B. Do not cause or allow any of the work to be covered up or enclosed until it has been inspected and approved by the engineer. Should any of the work be covered up or enclosed before such inspection, the contractor shall at his own expense, uncover the work, and after it has been inspected and approved, make all repairs with such materials as may be necessary to restore all his work to its original and proper conditions.

### **1.4 SAFETY**

- A. Contractor shall provide the Engineer with a copy of the safety manual or document utilized by the crew leader. Safety meetings shall be conducted on a daily basis before shift starts.

### **1.5 LAB REQUIREMENTS**

- A. The laboratory used shall be registered by the State of California. Contractor shall provide the Engineer with the laboratory analysis and reporting techniques to be used. All work provided by the laboratory to the Contractor shall be submitted in the project report as received from the lab.

### **1.6 CONSTRUCTION SCHEDULE**

- A. All work shall be performed during non-business hours of the facility. All HVAC systems shall be returned to normal operating conditions at the end of each shift. All work areas shall be cleaned up after each shift so to have no impact on normal operations of the facility or personnel. Refer to Division 1 of the specifications for approved work schedules.

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**PART 2 - EQUIPMENT**

**2.1 CLEANING EQUIPMENT**

- A. Provide equipment and materials for cleaning, repairing and inspection work including scaffolding, wire brushes, rotary brushes, filters, air lances, mechanical agitators, fiber optic borescopes, vacuums, or other equipment and materials necessary for workmen to perform work specified. Any chemical utilized in this project shall have a Material Safety Data Sheet (MSDS) submitted to the State before product usage.
- B. Should the cleaning methodology require power vacuuming, the Contractor shall provide HEPA filtered power vacuum(s) operating at a minimum of 16,000 C.F.M. at 21" P.S.I., 25 C.F.M. air compressor operating at 210# P.S.I.; electric power vent cleaner and reverse jet air flow nozzle, or similar equipment required to properly carry out the work. Suitable protective covering shall be provided by the Contractor in all areas of work operation. Any mechanical defects to be reported to the Engineer and logged.

**2.2 ACCESS DOORS**

- A. Galvanized steel access doors and frames in duct work and plenums shall be, as a minimum, of same thickness sheet metal as duct or plenum in which installed and shall be of the double paneled or hollow type. Doors in insulated ducts shall be set flush with the exterior insulation surface and shall be of the double panel insulated type with a minimum of one inch (1") thick insulation.
- B. Doors 72 inches and over in height shall have four hinges; doors 24" to 71" shall have three hinges and doors under 24" shall have two hinges. Access doors over 22" in height shall be equipped with two latches; doors 14" to 21" with one latch. Access doors which are 14" x 14" and smaller shall be removable (without hinges and shall have a minimum of two sash latch fasteners).
- C. Access doors to outside air, return air, mixed air and coil plenums for air handlers shall have operable handles both sides of door.
- D. All doors shall seal against neoprene gaskets. Door installations shall be made air tight on all supply, return and exhaust ducts, plenums and equipment with a four ounce, four inch (4") wide tape saturated with solvent lagging adhesive and firmly applied. Solvent shall be non-flammable. The stripping shall be applied prior to insulation repairs. All materials shall be 25/50 flame/smoke spread rated.
- E. Ceiling access shall be Karp Associates type Katr or equal. Ceiling access door shall be designed to provide access in the existing suspended ceiling that is part of the fire rated floor - ceiling assembly the combination of steel, wall board and ceiling tile shall maintain the fire resistive qualities of the existing ceiling.
- F. Ceiling access shall be 30 inches by 22 inches maximum. Duct access doors shall be a minimum of 14 x 12 inches unless further limited by duct size.
- G. The ceiling access doors shall be installed according to the manufacturer's recommendations.



- H. Ceiling access door frame shall be 16 gage steel and door shall be 18 gage steel.
- I. Door shall be recessed 1-1/2 inches to accommodate double thickness of wall board and matching ceiling tile.
- J. Door hinge shall be continuous piano hinge.
- K. Locks shall be screwdriver operated with 1 inch stainless steel cam and lock studs (or shall be key operated cylinder lock with automatic dust shutter) furnished with plastic grommet to protect hole made in wall board and tile.
- L. Finish shall be prime coat of rust inhibitive electrostatic powder, baked grey or white enamel.
- M. Refer to contract drawings for framing details.

### **2.3 SANITIZING FLUID**

- A. Microban X580, Dichlorothen, Certi-Phene, or equal. Sanitizing fluid shall be applied to all scope-related surfaces after cleaning.

## **PART 3 - HYGIENIC MAINTENANCE PROCESS**

### **3.1 TEMPORARY FILTER MEDIA (IF REQUIRED)**

- A. Prior to any cleaning, temporary filter media is to be fitted to those diffusers/grilles or they may be sealed with a minimum of 6 mil polyethylene sheeting. All openings shall be suitably protected to avoid contamination and debris from entering the conditioned air spaces.

### **3.2 ESTABLISHMENT OF EXISTING CONTAMINATION LEVELS**

- A. As directed by the Engineer to evaluate existing contamination levels, Contractor shall take samples of contaminants within the duct work and in other strategic locations to track contaminants throughout the air delivery system. Particulate samples shall be gathered with sterile swabs and then analyzed for general identification. Microbial samples shall be collected by utilizing HYCON Contact Slides. Culturing methodology shall conform to manufacturer's specifications and requirements. Molds and Bacteria are the general microbial constituents to be sampled for at designated areas. Samples shall be clearly identified in the Pre and Post-Project Reports as to sampling locations. In addition, photographs shall be taken of these sample locations for documentation in the Pre and Post-Project Reports.
- B. Sample Locations
  - 1. 4 Supply duct
  - 2. 1 Mixing box (if any exist)
  - 3. 1 Return air duct
  - 4. 1 Air handling unit (coil area)
  - 5. 4 Ceiling return air plenum

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- C. Locations are to be sampled for ea/ Air Handling Unit System & related ductwork, as a minimum.
- D. Particulate Samples (Wipes): Shall be analyzed using microscopic techniques to identify general content; i.e. rust, fibrous, carbon, crystalline, etc. These will assist in tracking movement of material within the system and the areas of breakdown.
- E. Microbial Samples: Use Hycon agar contact surface slides to identify general levels of mold and bacteria present. Results shall be expressed in total CFU's (Colony Forming Units).
- F. Verification of Systems Cleaning: Shall be established initially by NADCA (National Air Duct Cleaning Association) Standards.

**3.3 DUCTWORK CLEANING PROCESS**

- A. Cleaning Methodology Option #1:
  - 1. Contractor shall install access ports into all supply and return ductwork at 15 feet maximum intervals. Access ports shall be a permanent reusable system 50 mm round or provide access doors that conform to Article 2.02 of this Section. All related duct work must not be cut into for cleaning purposes other than to install access points. The structural integrity of the duct work shall not be altered by access system installation. The duct access ports shall be installed with sheet metal screws onto the outside of the duct.
    - a. When access points are installed in concealed attic areas, visual checks are to be made of the condition of both the external duct insulation and the ducts themselves at "T" joints, etc. Where breaks in either insulation or duct work are found, these are to be documented and submitted as found.
    - b. After the work is done, the duct penetration (through the access port) shall be closed airtight with a threaded plug screwed into the access port.
  - 2. Prior to the start of the cleaning process the fan powered HEPA filtered collection devices shall be securely connected to the supply outlets to be treated. Sufficient negative pressure shall be generated within the designated duct runs to ensure all particulate contamination is removed and contained under controlled conditions.
  - 3. By inserting special air lances, mechanical agitators or rotary brushes through the installed access points, gently remove all loose contaminants from the interior surfaces of the duct work. Where duct work has internal insulation or other fragile components, take precautions not to disrupt or damage these sensitive areas. Under no circumstances shall any workers be allowed to climb inside of the duct work onto any fragile internal surfaces or components.
  - 4. Fan powered, high efficiency dust and particulate collection systems shall be utilized in areas where contaminants are being removed from the system. Contractor shall take all necessary precautions to prevent dirt and debris from entering the conditioned areas. The collection systems shall be a self-contained unit, with appropriate components to adequately prevent dirt and debris loosened from upstream duct mains and branches during cleaning operations from entering the conditioned spaces by capturing this debris within the collection device. The filter(s) utilized in the collection systems shall be an industrial grade

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type, labeled and certified HEPA filter to be no less than 99.97 percent efficient on particles of 0.3 microns and greater at rated flow.

**B. Cleaning Methodology Option #2:**

1. All ducts shall be thoroughly cleaned by power vacuuming. Ductwork that does not allow complete access shall be entered by means of access doors as described in Article 2.02 of this Section.

**C. All ducts shall be inspected as work proceeds. Any defects in the duct system found during the cleaning process shall be immediately brought to the attention of the Engineer. All minor repairs such as caulking, sealing, and reconnecting shall be performed as part of the contracted scope of work.**

1. Caulking or sealing compound:
  - a. 3-M No. 900 duct sealer, Tuff Bond No. 29, Permacel No. EZ-4719, Foster 32-14, United Duct Sealer, or equal.

**D. Doors shall be installed at selected locations so as to accommodate the complete cleaning of the ductwork systems but not exceeding 10 foot intervals.**

**E. Internal Lining or Fiberglass Manufactured Ducts:**

1. Where supply ducts have either internal lining (fiberglass) insulation or are fiberglass manufactured ducts, the internal surfaces shall be coated, to control surface breakdown. Apply second coating, if required, to ensure complete encapsulation. Coating shall meet 25/50 flame and smoke spread as tested in accordance with ASTM E84.

**F. Grilles, Registers, and Diffusers:**

1. Whenever the grilles, registers and diffusers are removable, they shall be removed, vacuum cleaned, washed, dried and then reinstalled. Non-removable grilles, registers, and diffusers shall be cleaned in place.

**G. Duct Coils:**

1. Clean duct coils by air washing and brushing to ensure all contaminants are removed from between the fins. If fins are bent prior to cleaning, utilize a coil combing system to straighten fins as best as possible.

**3.4 DUCT COIL CLEANING PROCESS**

- A. Duct mounted coils shall be hand washed (air or water) on both coil faces carefully to avoid damage to tubes and fins. Thoroughly clean coil faces ensuring contaminants are removed. Remove corrosion from around coil frames; hand brush and vacuum clean. Paint all corroded metal frame surfaces. Where necessary, recomb coil fins to restore them to original condition. Before cleaning process begins on both sides of the coil perform before and after pressure readings.**

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**3.5 DAMPER, MOTOR, TURNING VANES AND LINKAGE CLEANING AND REPAIR  
PROCESS**

- A. Control dampers for air handling systems, duct-mounted volume, fire and zone dampers, and turning vanes shall be inspected, cleaned and repaired. Mark dampers to their current setting. Contractor shall assume one volume damper per branch and that 50% are not functioning and will require major repairs or replacement.
- B. Repairs shall include straightening and aligning of vanes, blades and linkages.
- C. All related equipment shall be power vacuumed and high pressure washed where required.
- D. Areas with rust or scale build-up shall be wire brushed or scraped.
- E. All damper motors and linkages shall be lubricated and set into their original position upon completion of work. Lubricant material - Aerolex Dry Moly, or equal.

**3.6 MIXING BOX CLEANING AND REPAIR**

- A. Mixing boxes shall be cleaned. Work on each unit includes the following:
  - 1. Remove access panel from the base of mixing box, taking precautions not to disturb wires, cables, or setting of appurtenances of each mixing box or appurtenances adjacent to box.
  - 2. Remove loose contamination from the internal areas of the box.
  - 3. Repair patch all damaged insulation where necessary with Linacoustic fiber glass duct liner or equivalent. All insulation shall have as a minimum 1 inch thickness.
  - 4. After the removal of all loosened contaminants is completed and damaged insulation is repaired, the coating shall be carried out. Coat all insulated surfaces of the box interiors with a insulation sealant; Fosters 30-36, or equal. Apply second coating, if required, to ensure complete encapsulation.
  - 5. Actuators, linkages and dampers on all boxes shall be inspected and repaired. It is estimated 75% or more of the boxes need repair.

**3.7 EQUIPMENT ROOMS AND AIR PLENUM CLEANING PROCESS**

- A. Related air plenums and/or equipment room locations that are within the airstream of this project shall be thoroughly cleaned and sanitized utilizing lead dust cleanup procedures. Such work except ceiling return air plenums shall include the following:
- B. Remove all water from floor area, note leaks; report on pipe work conditions. Vacuum clean all surfaces, including walls, floors, and ceiling surfaces. All other debris shall be removed from the area by the Contractor. Plenum areas shall be visually inspected and sealed air-tight with an approved caulking compound.
- C. All supply duct lining shall be coated as in paragraph 3.03F.
- D. Remove all corrosion from all metal areas by scraping, sanding, or wire brushing.

- E. Contractor has the responsibility to ensure that all areas are left in a correct operating mode; all switches, lights, doors, hatches, and controls are returned to their original setting.
- F. Contractor shall, at the end of each shift, remove all waste dirt and debris resulting from the work performed.

### **3.8 AIR HANDLING UNIT CLEANING PROCESS**

- A. The air handling units shall be cleaned. Prior to work commencement, a pre-arranged schedule shall be established with the State Construction Supervisor. Work on each unit includes the following:
  - 1. Fresh air plenums shall be cleaned thoroughly. Inlet louvers, mixing dampers, and turning vanes, if corroded, shall be scraped, primed, and top coated as necessary. All debris shall be removed from plenum areas and concrete floors thoroughly cleaned to remove surface debris.
  - 2. Remove air filters. If metal is corroded, hand scrape, prime, and top coat the filter holding frames.
  - 3. Hand wire brush all areas of side, roof, and ceiling panels as necessary.
  - 4. Remove all corrosion from around coil frames and drain pans; hand brush and vacuum clean.
  - 5. Paint affected areas of coil frames, using a zinc rich primer and enamel top coat paint.
  - 6. Heating and Cooling Coils:
    - a. Prior to cleaning of coils, take a pressure reading on both sides of the coil while system is in operation. Take identical readings after the coil is cleaned; note pressure change and submit findings.
    - b. Cleaning will consist of washing downstream of coil first and then upstream utilizing a high pressure water cleaning system with a suitable biodegradable cleaning agent, thoroughly cleaning coil faces ensure all contaminants and materials are removed. Take precautions not to damage coil fins. If fins are bent prior to cleaning, straighten (as best as possible) fins utilizing a coil combing system. High power wash will be performed with a water spray device that delivers a minimum of 500 PSI. Detergent cleaning shall be followed by thorough rinsing with fresh water. Any degreasing of the coils shall be performed before final cleaning to ensure complete removal of any residual build-up.
    - c. Drain pans are to be cleaned and cleared before any pressure washing be performed, thus assuring complete and safe drainage.
  - 7. Vacuum clean and hand wash fan casing, motors and fan wheels so that all grease and debris is removed. A degreasing solution shall be used in areas where required.
  - 8. Hand scrape fan impellers and remove all loose contaminants from within the fan casing.
  - 9. Where insulation is damaged or fragile, repair patch as necessary. If the insulation facing is damaged non-existent, the facing shall be coated.
  - 10. Report all locations where access doors are missing and filter housings damaged or destroyed to the engineer.

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**PART 4 - POST PROJECT REQUIREMENTS**

**4.1 MONITORING PROGRAM AND WARRANTY**

- A. Provide one (2) year warranty of all work, dated from the project completion date. Provide quarterly visual inspections during the warranty period in 4 different areas of the building. Set up monitoring probes as required.

**4.2 POST PROJECT REPORT**

- A. Submit a post-project report within 45 calendar days of the completion of the project. The report shall summarize the project, contrast contamination levels of the sampling locations in the pre-project report, and provide photographic evidence documenting the results of the project (see Article 3.02 B of this Section).
- B. Record mechanical defects, insulation encapsulation, pressure readings from coils, and all air delivery system improvements. Provide photographic documentation of all information.
- C. Provide a record drawing showing the exact installed positions of all access doors and access ports.

**PART 5 - MISCELLANEOUS**

**5.1 CLEAN UP PROCEDURES**

- A. Upon completion of work, and at the end of each shift, clean up the assigned work area of all trash, rubble, rags, containers, materials, and equipment resulting from work on this contract, and remove same from the premises at no additional cost.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
  - 2. Balancing Domestic Water Piping Systems.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.3 REFERENCES AND STANDARDS**

- A. Associated Air Balance Council (AABC)
  - 1. National Standards for Total System Balance, latest edition.
- B. National Environmental Balancing Bureau (NEBB)
  - 1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

### **1.4 DEFINITIONS**

- A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications

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and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.

- B. Similar Terms: The following table is provided for clarification only:

<u>Similar Terms</u>		
<u>Contract Term</u>	<u>AABC Term</u>	<u>NEBB Term</u>
TAB Specialist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

- C. AABC: Associated Air Balance Council.
- D. NEBB: National Environmental Balancing Bureau.
- E. TAB: Testing, adjusting, and balancing.
- F. TAB Organization: Body governing practices of TAB Specialists.
- G. TAB Specialist: An entity engaged to perform TAB Work.

**1.5 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.

**1.6 INFORMATIONAL SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
1. Provide list of similar projects completed by proposed TAB field supervisor.
  2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.



- C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
  - 1. Submit examinations report with qualifications data.
- D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.
- F. Certified TAB reports.
  - 1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
  - 1. Instrument type and make.
  - 2. Serial number.
  - 3. Application.
  - 4. Dates of use.
  - 5. Dates of calibration.
    - a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

#### **1.7 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

#### **1.8 QUALITY ASSURANCE**

- A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC NEBB.
  - 1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.

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- B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:
  - 1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC NEBB.
    - a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.
  - 2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC NEBB as a TAB technician.
    - a. TAB technician shall have minimum 4 years TAB field experience.
- C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.
- D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.
- E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.
  - 1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.
- F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.
- G. TAB Standard:
  - 1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:
    - a. AABC National Standards for Total System Balance
    - b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
  - 2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
  - 3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.
- H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project

requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect offices of Capital.

1. Agenda Items:
    - a. The Contract Documents examination report.
    - b. The TAB plan.
    - c. Coordination and cooperation of trades and subcontractors.
    - d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.
  2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.
- I. Certify TAB field data reports and perform the following:
1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect.
- K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

## **1.9 WARRANTY**

- A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:
1. AABC Performance Guarantee.
  2. NEBB Quality Assurance Program.
- B. Refer to Division 01 Specifications for additional requirements.

## **1.10 COORDINATION**

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- C. Coordinate TAB work with work of other trades.

## **PART 2 - PRODUCTS (Not Applicable)**

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Contract Documents Examination Report:
  - 1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:
    - a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
    - b. Proposed corrective action necessary for proper system operation.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
  - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine system pumps to ensure absence of entrained air in the suction piping.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Report conditions requiring correction discovered before and during performance of TAB procedures.

- N. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### **3.2 PREPARATION**

- A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:
  - 1. General description of each air system and sequence(s) of operation.
  - 2. Complete list of measurements to be performed.
  - 3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
  - 4. Qualifications of personnel assigned to Project.
  - 5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc).
  - 6. Air terminal correction factors for the following:
    - a. Air terminal configuration.
    - b. Flow direction (supply or return/exhaust).
    - c. Effective area of each size and type of air terminal.
    - d. Air density.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.
  - 2. Automatic temperature-control systems are operational.
  - 3. Equipment and duct access doors are securely closed.
  - 4. Balance, smoke, and fire dampers are open.
  - 5. Isolating and balancing valves are open and control valves are operational.
  - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

### **3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
  - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
  - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 0713

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"Duct Insulation," Section 23 0716 "HVAC Equipment Insulation," Section 23 8000 Heating, Ventilating, and Air Conditioning."

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

**3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS**

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.
- C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.
  - 1. Use state-of-the-art instrumentation approved by TAB specialists governing agency.
  - 2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.
- D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.
- E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- H. Verify that motor starters are equipped with properly sized thermal protection.
- I. Check dampers for proper position to achieve desired airflow path.
- J. Check for airflow blockages.
- K. Check condensate drains for proper connections and functioning.
- L. Check for proper sealing of air-handling-unit components.
- M. Verify that air duct system is sealed as specified in Section 23 8000 "Heating, Ventilating, and Air Conditioning."

- N. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.
- O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

### **3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS**

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow. Alternative methods shall be examined for determining total CFM, i.e., Pitot-tube traversing of branch ducts, coil or filter velocity profiles, prior to utilizing airflow values at terminal outlets and inlets.
  - 2. Measure fan static pressures as follows to determine actual static pressure:
    - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
  - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Report the cleanliness status of filters and the time static pressures are measured.
  - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
  - 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
  - 6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
  - 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

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- B. Check operation of relief air dampers. Measure total relief air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust relief air dampers to provide 100 percent relief in economizer mode. Ensure that relief dampers close completely upon unit shutdown.
- C. Check operation of outside air dampers. Measure total outside air quantity at each stage of normal, economizer, power exhaust, or power exhaust economizer operation, as applicable to installed equipment. Adjust outside air dampers to provide 100 percent outside air in economizer mode. Ensure that outside air dampers close completely upon unit shutdown.
- D. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
  - 1. Measure airflow of submain and branch ducts.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
  - 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- E. Measure air outlets and inlets without making adjustments.
  - 1. Measure terminal outlets using a direct-reading digital backflow compensating hood. Use outlet manufacturer's written instructions and calculating factors only when direct-reading hood cannot be used due to physical obstruction or other limiting factors. Final report shall indicate where values listed have not been obtained by direct measurement.
- F. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
  - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents, if included.
  - 2. Adjust patterns of adjustable outlets for proper distribution without drafts. Terminal air velocity at five feet above finished floor shall not exceed 50 feet per minute in occupied air conditioned spaces.
- G. Do not overpressurize ducts.

**3.6 PROCEDURES FOR HEAT EXCHANGERS**

- A. Measure water flow through all circuits.
- B. Adjust water flow to within specified tolerances.



- C. Measure inlet and outlet water temperatures.
- D. Measure inlet steam pressure.
- E. Check settings and operation of safety and relief valves. Record settings.

### **3.7 PROCEDURES FOR MOTORS**

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
  - 1. Manufacturer's name, model number, and serial number.
  - 2. Motor horsepower rating.
  - 3. Motor rpm.
  - 4. Efficiency rating.
  - 5. Nameplate and measured voltage, each phase.
  - 6. Nameplate and measured amperage, each phase.
  - 7. Starter manufacturer's name, model number, size, type, and thermal-protection-element rating.
    - a. Starter strip heater size, type, and rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

### **3.8 PROCEDURES FOR CONDENSING UNITS**

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

### **3.9 PROCEDURES FOR HEAT-TRANSFER COILS**

- A. Measure, adjust, and record the following data for each electric heating coil:
  - 1. Nameplate data.
  - 2. Airflow.
  - 3. Entering- and leaving-air temperature at full load.
  - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
  - 5. Calculated kilowatt at full load.
  - 6. Fuse or circuit-breaker rating for overload protection.
- B. Measure, adjust, and record the following data for each refrigerant coil:
  - 1. Dry-bulb temperature of entering and leaving air.

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2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.

**3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS**

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  1. Measure and record the operating speed, airflow, and static pressure of each fan.
  2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  3. Check the condition of filters.
  4. Check the condition of coils.
  5. Check the operation of the drain pan and condensate-drain trap.
  6. Check bearings and other lubricated parts for proper lubrication.
  7. Report on the operating condition of the equipment and the results of the measurements taken. Report conditions requiring correction.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
  1. New filters are installed.
  2. Coils are clean and fins combed.
  3. Drain pans are clean.
  4. Fans are clean.
  5. Bearings and other parts are properly lubricated.
  6. Conditions requiring correction noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
  1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
  2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
  3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
  4. Balance each air outlet.

### **3.11 TOLERANCES**

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances: Plus 10 percent and minus 0 percent.
  - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent.
  - 2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent.
  - 3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for "Air Outlets and Inlets".
    - a. Room shall be balanced to create pressure relationship (positive, negative, or neutral) with adjacent spaces as indicated on Drawings. Maintain airflow differentials between supply, return, and exhaust indicated on Drawings.
- B. Set plumbing systems water flow rates within plus or minus 10 percent.

### **3.12 REPORTING**

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

### **3.13 FINAL REPORT**

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
  - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
  - 2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
  - 3. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
  - 1. Pump curves.
  - 2. Fan curves.
  - 3. Manufacturers' test data.
  - 4. Field test reports prepared by system and equipment installers.

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5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
  2. Name and address of the TAB specialist.
  3. Project name.
  4. Project location.
  5. Project Performance Guaranty
  6. Architect's name and address.
  7. Engineer's name and address.
  8. Contractor's name and address.
  9. Report date.
  10. Signature of TAB supervisor who certifies the report.
  11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  12. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  13. Nomenclature sheets for each item of equipment.
  14. Data for terminal units, including manufacturer's name, type, size, and fittings.
  15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outdoor-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.
    - e. Fan drive settings including settings and percentage of maximum pitch diameter.
    - f. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
  2. Duct, outlet, and inlet sizes.
  3. Pipe and valve sizes and locations.
  4. Terminal units.
  5. Balancing stations.
  6. Position of balancing devices.

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- E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.
- F. Test Reports – General:
  - 1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.
- G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and unit size.
    - e. Manufacturer's serial number.
    - f. Unit arrangement and class.
    - g. Discharge arrangement.
    - h. Sheave make, size in inches, and bore.
    - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - j. Number, make, and size of belts.
    - k. Number, type, and size of filters.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total air flow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Filter static-pressure differential in inches wg.
    - f. Cooling-coil static-pressure differential in inches wg.
    - g. Heating-coil static-pressure differential in inches wg.
    - h. Outdoor airflow in cfm.
    - i. Return airflow in cfm.

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- j. Relief airflow in cfm.
  - k. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
  - l. Return-air damper position.
  - m. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
- H. Apparatus-Coil Test Reports:
- 1. Coil Data:
    - a. System identification.
    - b. Location.
    - c. Coil type.
    - d. Number of rows.
    - e. Fin spacing in fins per inch o.c.
    - f. Make and model number.
    - g. Face area in sq. ft.
    - h. Tube size in NPS.
    - i. Tube and fin materials.
    - j. Circuiting arrangement.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Average face velocity in fpm.
    - c. Air pressure drop in inches wg.
    - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
    - e. Return-air, wet- and dry-bulb temperatures in deg F.
    - f. Entering-air, wet- and dry-bulb temperatures in deg F.
    - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    - h. Refrigerant expansion valve and refrigerant types.
    - i. Inlet steam pressure in psig.
- I. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
- 1. Unit Data:
    - a. System identification.
    - b. Location.
    - c. Coil identification.
    - d. Capacity in Btu/h.
    - e. Number of stages.
    - f. Connected volts, phase, and hertz.
    - g. Rated amperage.
    - h. Air flow rate in cfm.

- i. Face area in sq. ft.
    - j. Minimum face velocity in fpm.
  - 2. Test Data (Indicated and Actual Values):
    - a. Heat output in Btu/h.
    - b. Air flow rate in cfm.
    - c. Air velocity in fpm.
    - d. Entering-air temperature in deg F.
    - e. Leaving-air temperature in deg F.
    - f. Voltage at each connection.
    - g. Amperage for each phase.
- J. Fan Test Reports: For supply, return, and exhaust fans, include the following:
  - 1. Fan Data:
    - a. System identification.
    - b. Location.
    - c. Make and type.
    - d. Model number and size.
    - e. Manufacturer's serial number.
    - f. Arrangement and class.
    - g. Sheave make, size in inches, and bore.
    - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
  - 2. Motor Data:
    - a. Motor make, and frame type and size.
    - b. Horsepower and rpm.
    - c. Volts, phase, and hertz.
    - d. Full-load amperage and service factor.
    - e. Sheave make, size in inches, and bore.
    - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    - g. Number, make, and size of belts.
  - 3. Test Data (Indicated and Actual Values):
    - a. Total airflow rate in cfm.
    - b. Total system static pressure in inches wg.
    - c. Fan rpm.
    - d. Discharge static pressure in inches wg.
    - e. Suction static pressure in inches wg.
- K. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:

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- a. System and air-handling-unit number.
  - b. Location and zone.
  - c. Traverse air temperature in deg F.
  - d. Duct static pressure in inches wg.
  - e. Duct size in inches.
  - f. Duct area in sq. ft..
  - g. Indicated air flow rate in cfm.
  - h. Indicated velocity in fpm.
  - i. Actual air flow rate in cfm.
  - j. Actual average velocity in fpm.
  - k. Barometric pressure in psig.
- L. Air-Terminal-Device Reports:
  - 1. Unit Data:
    - a. System and air-handling unit identification.
    - b. Location and zone.
    - c. Apparatus used for test.
    - d. Area served.
    - e. Make.
    - f. Number from system diagram.
    - g. Type and model number.
    - h. Size.
    - i. Effective area in sq. ft.
  - 2. Test Data (Indicated and Actual Values):
    - a. Air flow rate in cfm.
    - b. Air velocity in fpm.
    - c. Preliminary air flow rate as needed in cfm.
    - d. Preliminary velocity as needed in fpm.
    - e. Final air flow rate in cfm.
    - f. Final velocity in fpm.
    - g. Space temperature in deg F.
- M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
  - 1. Unit Data:
    - a. Unit identification.
    - b. Location.
    - c. Service.
    - d. Make and size.
    - e. Model number and serial number.
    - f. Water flow rate in gpm.



- g. Water pressure differential in feet of head or psig.
- h. Required net positive suction head in feet of head or psig.
- i. Pump rpm.
- j. Impeller diameter in inches.
- k. Motor make and frame size.
- l. Motor horsepower and rpm.
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. Full-load amperage and service factor.
- p. Seal type.
- 2. Test Data (Indicated and Actual Values):
  - a. Static head in feet of head or psig.
  - b. Pump shutoff pressure in feet of head or psig.
  - c. Actual impeller size in inches.
  - d. Full-open flow rate in gpm.
  - e. Full-open pressure in feet of head or psig.
  - f. Final discharge pressure in feet of head or psig.
  - g. Final suction pressure in feet of head or psig.
  - h. Final total pressure in feet of head or psig.
  - i. Final water flow rate in gpm.
  - j. Voltage at each connection.
  - k. Amperage for each phase.

N. Instrument Calibration Reports:

- 1. Report Data:
  - a. Instrument type and make.
  - b. Serial number.
  - c. Application.
  - d. Dates of use.
  - e. Dates of calibration.

### **3.14 INSPECTIONS**

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
  - a. Measure airflow of at least 10 percent of air outlets.
  - b. Measure water flow of at least 5 percent of terminals.
  - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

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- d. Verify that balancing devices are marked with final balance position.
- e. Note deviations from the Contract Documents in the final report.

**B. Final Inspection:**

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
- 2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
- 3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
- 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

**C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:**

- 1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
- 2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
- 3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

**D. Prepare test and inspection reports.**

**3.15 ADDITIONAL TESTS**

- A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes: Requirements for commissioning of HVAC systems for Title 24 (T-24) compliance.
- B. Scope: Commissioning Coordinator shall complete the building systems commissioning requirements of the California Energy Code, as applicable to Project. It is not the intention of Project specifications to require duplication in testing.
  - 1. T-24 commissioning activities may be coordinated with Contractor tests and TAB work specified in technical Sections.
  - 2. T-24 commissioning activities may be coordinated with LEED and CHPS program commissioning activities, as applicable to Project.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The requirements of this Section apply to all Sections of Division 23.
- C. In the event of conflict between requirements of Division 01 Title 24 commissioning specifications and this Section, Division 01 requirements shall prevail.

### **1.3 REFERENCES**

- A. 2022 California Energy Code.
- B. 2022 California Energy Code and Building Energy Efficiency Standards Reference Appendices.
- C. 2022 Building Energy Efficiency Standards Nonresidential Compliance Manual.

### **1.4 DEFINITIONS**

- A. Commissioning Coordinator: General Contractor, or an entity engaged by the General Contractor to perform T-24 commissioning.
- B. Covered Processes: Process equipment for which there are listed requirements in the California Energy Code.
- C. OPR: Owner's Project Requirements.
- D. TAB: Testing, Adjusting, and Balancing.

### **1.5 SUBMITTALS (FOR RECORD ONLY)**

- A. Submit the following:

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1. Commissioning Plan.
  2. Systems Manual.
  3. Commissioning Report.
  4. Certificates of Installation.
  5. Certificates of Acceptance.
- B. Above items for inclusion in closeout documents submitted to authorities having jurisdiction.

**PART 2 - PRODUCTS**

**2.1 TEST INSTRUMENTS**

- A. Commissioning Coordinator shall supply test instruments. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if recommended by instrument manufacturer, and be checked for accuracy prior to start of work.

**PART 3 - EXECUTION**

**3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES**

- A. Architect/Engineer:
1. Performs construction observation. Provides construction observation reports.
  2. Reviews and approves Commissioning Plan, Systems Manual, and Commissioning Report.
  3. Assists in problem resolution.
- B. Commissioning Coordinator:
1. Coordinates commissioning process.
  2. Develops Commissioning Plan.
  3. Schedules and conducts functional testing. Completes Certificates of Acceptance.
  4. Assembles Systems Manual.
  5. Schedules and conducts systems operations training. Verifies systems operations training completion.
- C. HVAC Subcontractor: Assists in functional testing.
- D. Electrical Subcontractor: Assists in functional testing.
- E. Controls Subcontractor: Assists in functional testing.
- F. TAB Subcontractor: Assists in functional testing.
- G. Equipment Manufacturers/Vendors:

1. Performs Check, Test, and Start of equipment and systems, as required by Project technical Sections.
2. Provides systems and equipment documentation required to complete functional testing and assemble Systems Manual.

### **3.2 COMMISSIONING PLAN**

- A. Commissioning Coordinator shall author the code-required Commissioning Plan. The Commissioning Plan shall address HVAC systems for which commissioning is required. The Commissioning Plan shall be updated by Commissioning Coordinator throughout the construction process. The Commissioning Plan shall contain the following:
1. General Project Information: Commissioning Coordinator shall obtain general Project information from Project architectural Drawings.
  2. Commissioning Goals:
    - a. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
    - b. Verify and document proper integrated performance of equipment and systems utilizing functional testing for mechanical system acceptance, as required by the California Energy Code.
    - c. Verify that Systems Manual documentation is complete.
    - d. Verify that operating personnel are trained to enable them to operate, monitor, adjust, and maintain HVAC systems in an effective and energy-efficient manner.
  3. Commissioning Coordinator shall compile the following information and include in Commissioning Plan:
    - a. An explanation of original design intent: Commissioning Coordinator shall obtain copies of the OPR and BOD for the Project.
    - b. Equipment and systems to be tested, including the extent of tests: Test 100 percent of a given type of installed equipment having associated Acceptance Requirements.
      - 1) Refer to forms MCH-01-E on Drawings for systems to be commissioned.
      - 2) Covered Processes: In addition to systems listed in MCH-01-E on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
        - a) Parking garage ventilation systems.
        - b) Compressed air systems.
        - c) Type 1 Kitchen exhaust systems.
    - c. Functions to be tested: Refer to 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
    - d. Conditions under which the test shall be performed.

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- e. Measureable criteria for acceptable performance: Refer to 2016 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
- f. Commissioning team information:
  - 1) Refer to Project information on architectural Drawings for design team participants. Commissioning Coordinator shall add subcontractor information to provided design team information and include in Commissioning Plan.
- g. Commissioning process activities, schedules, and responsibilities. Plans for the completion of functional performance testing, systems operations training, and commissioning report.

**3.3 CERTIFICATES OF INSTALLATION**

- A. Commissioning Coordinator shall complete applicable Certificates of Installation forms.

**3.4 FUNCTIONAL TESTING REQUIREMENTS**

- A. Contractor shall complete the applicable Acceptance Requirements for Code Compliance contained in the California Building Energy Efficiency Standards. Refer to T-24 compliance forms on Drawings for systems having Acceptance testing requirements. Contractor shall perform Acceptance tests and complete the appropriate "Certificates of Acceptance." Contractor shall engage certified HERS Rater to verify duct leakage rate for duct systems indicated on T-24 compliance forms on Drawings as requiring duct leakage rate testing. For additional duct leak testing requirements, refer to Section 23 8000, "Heating, Ventilating, and Air Conditioning," Article, "Ductwork Sealing and Leak Testing."
  - 1. Covered Processes: In addition to systems listed on T-24 compliance forms on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
    - a. Parking garage ventilation systems.
    - b. Compressed air systems.
    - c. Type 1 Kitchen exhaust systems.

**3.5 SYSTEMS MANUAL**

- A. Commissioning Coordinator shall assemble Systems Manual in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications.

**3.6 SYSTEMS OPERATIONS TRAINING**

- A. Commissioning Coordinator shall provide systems operations training in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications.

**3.7 COMMISSIONING REPORT**

- A. Commissioning Coordinator shall complete Commissioning Report in accordance with the requirements of the California Energy Code and Division 01 commissioning specifications.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes equipment and performance criteria for furnishing all labor and materials for the installation and programming for "Pelican" Energy Management System for HVAC Systems utilizing wireless communication with cloud based servers.

**1.2 RELATED SECTIONS:**

- A. Division 01: General Requirements
- B. Section 23: Heating, Ventilating, and Air-Conditioning (HVAC)

**1.3 SUBMITTALS:**

- A. Shop Drawings and product data in accordance with the specifications.
- B. All shop drawings shall be prepared in AutoCAD 2000 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.
- C. All submittals shall be bound or in a three ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or engineer for distribution and review.
- D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.
- E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.
- F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

**1.4 SCOPE OF WORK**

- A. Except as otherwise noted, the control system shall consist of all thermostats, and gateways to fill the intent of the specification and provide for a complete and operable system.



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- B. The EMS Contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.
- D. When the EMS system is fully installed and operational, the EMS Contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the EMS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
- E. The Contractor shall furnish and install a complete EMS control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install EMS controls for the HVAC Equipment as noted on the drawings:
- F. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and the owner's team.
- G. Contractor shall provide one training session in the operation of the system, for owner's personnel.
- H. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

**1.5 SYSTEM DESCRIPTION**

- A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.
- B. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner's wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

**1.6 WORK BY OTHERS**

- A. The EMS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. EMS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.
- B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by the Mechanical Contractor. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's installation instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum 3 conductor / 24 gauge wires per EMS manufacturer's standard specifications, multiple c conductor/24 gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)
- C. Related work provided by others:
  - 1. 110 V outlets shall be provided within 5 feet of each gateway location.
  - 2. 1 Data port shall be provided within 10 feet of each gateway location.
- D. Equipment start-up and servicing

**1.7 CODE COMPLIANCE**

- A. Provide EMS components and ancillary equipment which are code compliant.
- B. All wiring shall conform to the National Electrical Code.
- C. All products of the EMS shall reside with the following agency approvals.
  - 1. California 2022 Title 24 Compliant.
  - 2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
  - 3. OpenADR2.0 certified.

**1.8 SYSTEM STARTUP AND COMMISSIONING**

- A. Each EMS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the EMS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

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- B. The EMS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The EMS Contractor shall have a trained technician available on request during the balancing of the systems. The EMS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to EMS.

**1.9 TRAINING**

- A. The EMS Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The EMS Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description:
- B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
  - 1. System Overview
  - 2. System Software and Operation
  - 3. System access
  - 4. Software features overview
  - 5. Changing set points and other attributes
  - 6. Scheduling
  - 7. Editing programmed variables
  - 8. Displaying color graphics
  - 9. Running reports
  - 10. Workstation maintenance
  - 11. Application programming
  - 12. Operational sequences including start-up, shutdown, adjusting and balancing.
  - 13. Equipment maintenance

**1.10 OPERATING AND MAINTENANCE MANUALS**

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire EMS. This documentation shall include specific part numbers.
- B. Following project completion and testing, the EMS contractor will submit as-built documentation reflecting the exact installation of the system.

**1.11 WARRANTY**

- A. The EMS Contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the EMS Contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. EMS equipment shall be warranted for a period of 5 years from the time of system acceptance.

- B. Warranty of equipment is limited to replacement of defective products.

## **PART 2 - PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems,
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Project Manager at least 10 days prior to bid due date.

### **2.2 WIRELESS GATEWAY (WG)**

- A. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements
- B. The WG must provide the following hardware features as a minimum:
  - 1. Single Ethernet Port.
  - 2. One micro-USB 5VDC power input.
  - 3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.
- C. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).
- D. The WG shall be able to support 2000 Internet Programmable Thermostats.

### **2.3 INTERNET PROGRAMMABLE THERMOSTAT (IPT)**

- A. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.
- B. The IPT shall provide a keypad for setting:
  - 1. Temperature Set points.
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Light Button.

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- C. The IPT shall include a wiring terminal for controlling a single zone HVAC unit. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the HVAC unit it will be controlling. Over these 3-wires the thermostat must still be able to control the HVAC unit based on these specifications.
- D. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:
  - 1. Naming the thermostat
  - 2. Grouping multiple thermostats.
  - 3. Heat Pump or Conventional system setting.
  - 4. If Heat Pump; reversing valve O or B setting.
  - 5. Cycles Per Hour (1 - 6).
  - 6. Anticipation Degrees (0°F - 0.5°F)
  - 7. Calibration Degrees (2.0°F - -2.0°F)
  - 8. Heat Stages (0 - 2)
  - 9. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
  - 10. Cool Stages (0 - 2)
  - 11. Fan Stages (1 - 2)
  - 12. Fan Circulation Minutes Per Hour.
  - 13. Temperature Display (Fahrenheit or Celsius)
  - 14. Heat Range Temperature Setting Limitation
  - 15. Cool Range Temperature Setting Limitation
  - 16. Ability to disable and enable Keypad Control through schedule.
  - 17. Heat consumption (kw, btu, ton, or watt)
  - 18. Cool consumption (kw, btu, ton, or watt)
  - 19. Notification Sensitivity (High, Medium, Low)
  - 20. Alarm of exceeding temperature based on a Safe Range
  - 21. Schedule set times (2, 3, 4, or Variable).
- E. IPT settings and control through the Web Base App shall be in real-time and include:
  - 1. Space Temperature
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).
  - 4. Current set point.
  - 5. Relay status (Heat/Cool and Fan).
  - 6. Historical Trend Graphs.
  - 7. Scheduling
  - 8. Lock and Unlock Entire Thermostat's Keypad
  - 9. Lock and Unlock the Thermostat's Fan Mode setting Only

## **2.4 WEB BASED GRAPHICAL USER INTERFACE**

- A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.
- B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.
- C. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.
- D. The Web Based client shall support at a minimum, the following functions:
  - 1. User log-on identification and password shall be required.
  - 2. HTML programming shall not be required to display any graphics or data on the Web page.
  - 3. Storage of data shall reside within the cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or an on-site server is not acceptable.
  - 4. Users shall have administrator and user definable access privileges.
  - 5. OpenAPI interface with XML data output.
- E. Schedules:
  - 1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
  - 2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
  - 3. The WBA shall provide the user the ability to:
    - a. View Schedules.
    - b. Add/Modify Schedules.
    - c. Assign Thermostat to a Group Schedule.
    - d. Delete Schedules.
- F. Trending
  - 1. The WBA shall provide real-time trend information on:
    - a. Each IPT's space temperature.
    - b. Each IPT's temperature set points.
    - c. Each IPT's current call; heat, cool, and/or fan.
    - d. Each IEE's call for economization
  - 2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
    - a. space temperature; with resolution of every 1/10th of a degree Fahrenheit.
    - b. IPT's temperature set points.
    - c. indication of whether the thermostat was calling for; heat, cool, and/or fan.

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3. Trend data shall be viewable on the WBS

**G. Alarm Notifications**

1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
  - a. space temperature and temperature change.
  - b. IPT's temperature set points.
  - c. IPT's current call; heat, cool, and/or fan.
2. The WBA shall be able to provide a user with the ability to:
  - a. View Alarms.
  - b. Set Alarm Notification sensitivity level to High, Medium, or Low.
  - c. Delete Alarms.
3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

**H. Consumption Usage**

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

**2.5 WIRED REMOTE TEMPERATURE SENSORS AND DIGITAL ALARM INPUT**

**A. Input Temperature Sensor (ITS).**

1. The ITS shall connect to the Internet Programmable Thermostat over 3-wires.
2. ITS shall provide at least one external 10K Type II thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past temperature data for ITS.
4. The trend data shall be viewable on the WBA.
5. ITS must be accurate to  $\pm 1.0^{\circ}\text{F}$
6. ITS must be able to be installed up to 500' away from IPT using standard thermostat wiring.

**2.6 INTERNET ENABLED ECONOMIZER (IEE)**

- A. The IEE shall connect to the Internet Programmable Thermostat (ITS) with ONLY 3-wires. No additional wiring must be required between the IEE and the ITS to gain complete Title 24 compliant economization control.
- B. IEE shall provide up to three 10K Type II external thermistor temperature sensor input.
- C. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:
  - 1. Calls for Economization
  - 2. Outside Air Damper Position
  - 3. Supply and Outside Air Temperature
- D. The trend data shall be viewable on the WBA.
- E. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.
- F. IEE must be able to be installed up to 500' away from IPT using standard thermostat wiring.
- G. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.
- H. IEE must have a settable 0-10VDC output for Variable Frequency Drive (VFD) control.
  - 1. IEE must be configurable for different VFD speeds based on calls for cold, heat, and ventilation.
- I. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.

**2.7 WIRELESS PROXIMITY SENSORS**

- A. Wireless Proximity Sensor (WPS).
  - 1. The WPS shall connect with the Internet Programmable Thermostat over the 802.15.4 wireless network.
  - 2. WPS shall be powered by 2 AA batteries or equivalent.
  - 3. WPS must be able to be used for either:
    - a. Accepting a motion sensor's 2-wire dry contact output.
      - 1) The WPS shall be able to notify an Internet Programmable Thermostat if a motion sensor's dry contact is in either the open or closed position.
      - 2) Dry contact open positions will indicate that the space is occupied and the IPT must be able to automatically setback its temperature setting by a range of 0F - 10F or OFF.
      - 3) Dry contact closed position will indicate that the space is unoccupied and set the temperature to a comfort setting when the space is occupied.



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- 4) Setback settings and comfort settings must be settable through the Internet Programmable Thermostat's schedule through the Web Based App (cannot be settable at thermostat).
  - 5) Web Based App must be able to display when a space is "Unoccupied".
- b. Detecting if a Window OR Door is Opened or Closed.
  - 1) The WPS must have a built-in magnetic sensor and come with a magnet that can be installed on a door OR window.
  - 2) The WPS must be able to notify an Internet Programmable Thermostat if the door is open and the IPT must automatically turn to the OFF position.
  - 3) The WPS must be able to notify an Internet Programmable Thermostat if the door is closed and the IPT must automatically return to its last temperature and system settings.
  - 4) Web Based App must be able to display when the Door OR Window is Open and must be able to be set to indicate "Door" or "Window".
4. Web Based App shall be able to notify if the WPS batteries are low and record and provide at least two years of past history on occupancy and/or door/window status for each space a WPS is installed in.
5. The trend data shall be viewable on the Web Based App.
6. Internet Programmable Thermostat must be able to connect with at least 8 WPS, each WPS must have a unique serial number and each WPS shall be settable, through the Web Based App, as either a motion sensor input or as a door/window sensor.

**PART 3 - EXECUTION**

**3.1 CONTRACTOR RESPONSIBILITIES**

**A. General**

1. Installation of the Energy Management System shall be performed by an approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.

**B. Demolition**

1. Remove controls which do not remain as part of the Energy Management System. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

**C. Access to Site**

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.

D. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

E. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

**3.2 WIRING, CONDUIT, AND CABLE**

- A. All control wires between HVAC units and thermostat locations to be furnished and installed by the Mechanical Contractor. The EMS Contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the EMS Contractor. The EMS Contractor shall provide wiring between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

**3.3 HARDWARE INSTALLATION**

A. Installation Practices for Devices

1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. Identification

1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers will be marked to indicate that they are a part of the EMS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

C. Existing Controls.

1. Existing controls are not to be reused. All EMS devices will be new.

D. Control System Switch-over

1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

E. Location

1. The location of sensors is per mechanical and architectural drawings.

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2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
3. If Input Temperature Sensor(s) (ITS) is used as Outdoor air sensor, outdoor air sensors will be mounted on the north building face directly in the outside air. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
4. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

**3.4 SYSTEM PROGRAMMING**

A. General.

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the Contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

**3.5 COMMISSIONING AND SYSTEM STARTUP**

A. EMS device functional testing.

1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.
2. Please contact Tom Hardy of RSD-Total Control for project quotation @ 916-600-3027.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Fans.
  - 2. Air inlets and outlets.
  - 3. Filters.
  - 4. Dampers.
  - 5. Ductwork.
  - 6. Insulation.

### **1.2 RELATED REQUIREMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 23 0050, Basic HVAC Materials and Methods.
- C. Section 23 0593, Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 0900, Direct Digital Control (DDC) System for HVAC.

### **1.3 ACTION SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 0050, Basic HVAC Material and Methods for additional requirements.
  - 1. Upon approval of submittal, provide manufacturer's installation and operating instructions to the Project inspector for the following:
    - a. Fire dampers, smoke dampers, and combination smoke-fire dampers.
    - b. Type 1 kitchen exhaust field applied grease duct enclosures.
- C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

### **1.4 CLOSEOUT SUBMITTALS**

- A. For additional requirements, refer to Section 23 0050, Basic HVAC Materials and Methods.

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- B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.
- C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

**1.5 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Belts: One set(s) for each belt-driven unit.
  - 2. Provide one complete set(s) of filters for each filter bank.

**1.6 COORDINATED LAYOUT**

- A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.
- B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to design Drawings.
  - 1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
  - 2. Show on drawings the intended elevation of all ductwork in accordance with the following example:
    - a. B.O.D. = 9'-0"  
OFFSET UP 6"  
B.O.D. = 9'-6"
  - 3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.
- C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

- D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

## **1.7 QUALITY ASSURANCE**

### **A. Design Criteria:**

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

## **1.8 FIELD CONDITIONS**

- A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:
  1. Notify Architect no fewer than two days in advance of proposed interruption of services.
  2. Do not interrupt services without Architect's written permission.

## **1.9 WARRANTY**

- A. Air Cooled Condensing Unit: Unit shall have 5 year limited compressor warranty.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

## **PART 3 - AIR CONDITIONING SYSTEM PRODUCTS**

### **A. SPLIT SYSTEM HEAT PUMPS**

- B. General: Furnish and install split system air-to-air heat pump system, with R410A refrigerant, and complete with automatic controls. Equipment shall be shipped factory assembled, wired, tested, and ready for field connections.

### **C. Quality Assurance:**

1. Unit shall be ETL or UL listed and labeled.

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2. Unit shall be manufactured in a facility registered to ISO 9001:2000.
  3. Unit shall be rated in accordance with ARI standard 210.
- D. Delivery, Storage and Handling: Follow manufacturer's recommendations.
- E. Heating/Cooling System: The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.
- F. Indoor Section: Wall mounted, ceiling surface mounted, or ceiling recessed mounted, as indicated on Drawings.
1. Cabinet:
    - a. Wall mounted: Molded white high strength plastic.
      - 1) Provide wall mounted unit with factory mounting plate.
    - b. Ceiling surface mounted: Molded white high strength plastic with provision for outside air duct connection.
    - c. Ceiling recessed mounted: galvanized steel with provision for outside air duct connection.
  2. Fans: Double inlet, forward curved, statically and dynamically balanced.
  3. Fan Motor: Direct drive, permanently lubricated, with two or 4 speed operation for unit size scheduled on Drawings.
    - a. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 0050, Basic HVAC Materials and Methods.
  4. Air Outlet: With motorized horizontal and vertical vanes.
    - a. Wall and ceiling surface mounted units: Horizontal vane shall close air outlet upon unit shut-down.
  5. Evaporator Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested.
  6. Insulation: Interior surfaces exposed to the airstream shall be fully insulated.
- G. Outdoor Section:
1. Casing: Galvanized steel plate, powder coated with acrylic or polyester.
  2. Condenser Fan Grille: ABS plastic.
  3. Fan and fan motor: Direct drive, totally enclosed, propeller type, permanently lubricated, horizontal discharge.
  4. Compressor: Variable speed rotary type, with crankcase heater and accumulator. Compressor shall be capable of operating at 0 degrees F. Compressor mounted on vibration isolator pads.
  5. Coil: Aluminum fins mechanically bonded to copper tubes. Coils shall be pressure leak tested. Provide coil with integral metal guard.
- H. Controls: Hard wired, microprocessor based, wall mounted controller with LCD display shall provide the following functions, as a minimum:
1. Pelican Controls.

2. Test and check functions.
  3. Diagnostic functions.
  4. Vane position control.
  5. Fan speed adjustment.
  6. Temperature adjustment.
  7. Automatic restart.
  8. Mode selection, including heat/auto/cool/dry/fan.
    - a. Provide lockable enclosure for wall mounted controller.
- I. Safeties: Shall include the following, as a minimum:
1. Five minute compressor anti-recycle timer.
  2. High pressure protection.
  3. Current and temperature sensing motor overload protection.
- J. Filters: Provide manufacturers washable filters for indoor unit. Provide sufficient filters for four complete changes for each unit.
- K. Service Access: All components, wiring, and inspection areas shall be completely accessible through removable panels.
- L. Refrigerant Piping:
1. Provide factory pre-charged and sealed line set piping, length to suit the location of equipment. Tubing sizes shall be in accordance with manufacturers written instructions.
  2. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
- M. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Lennox to match Lodi USD District Standards for Multi-Zone Applications.
- N. Owner Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.
- 3.2 AIR COOLED CONDENSING UNIT**
- A. Provide outdoor-mounted, factory assembled, single piece, air-cooled, split-system air conditioner unit suitable for ground or rooftop installation, rated in accordance with ARI Standard 210, and UL or ETL listed and labeled. Provide refrigerant charge R-410A, all internal wiring, piping, controls, compressor, and special features required prior to field start-up. Design unit to conform to the following:
1. ANSI/ASHRAE latest edition.
  2. NEC latest edition.
  3. Unit cabinet to be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hr salt spray test.



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4. Unit shall be constructed in accordance with UL standards.
- B. Unit shall be certified for capacity and efficiency, and listed in the latest ARI directory.
- C. Unit shall be manufactured in a facility registered to ISO 9001:2000.
- D. Unit shall be Energy Star Qualified.
- E. Provide unit with 5 year limited parts warranty.
- F. Cabinet:
  1. Unit cabinet constructed of galvanized steel, bonderized, and coated with powder coat paint.
- G. Fans:
  1. Direct-drive propeller type condenser fan, discharging air vertically.
  2. Totally enclosed condenser fan motors, 1-phase type with Class B insulation and permanently lubricated bearings, and corrosion resistant shafts.
  3. Condenser fan openings equipped with PVC-coated steel wire safety guards.
  4. Statically and dynamically balanced fan blades.
- H. Compressor:
  1. Hermetically sealed compressor mounted on rubber vibration isolators.
  2. Compressor with sound insulator.
- I. Refrigeration Components:
  1. Refrigerant circuit to include liquid and vapor line shut-off valves with sweat connections.
  2. System charge of R-410A refrigerant and compressor oil.
  3. Unit to be equipped with factory-supplied high-pressure switch, low pressure switch, and filter drier.
  4. Provide unit with manufacturer's refrigerant line set.
  5. Provide refrigeration piping in accordance with Article, Refrigerant Piping, in this Section.
- J. Condenser Coil:
  1. Air-cooled condenser coil constructed of aluminum fins mechanically bonded to copper tubes.
  2. Coils shall be leak and pressure tested.
- K. Electrical Requirements:
  1. Unit shall have single point power connection.
  2. Provide unit with 24V control circuit.

- L. Operating Characteristics:
  - 1. Unit shall be capable of starting and running a 115 degrees F ambient outdoor temperature per maximum load criteria of ARI Standard 210.
  - 2. Compressor with standard controls shall be capable of operation down to 55 degrees F ambient outdoor temperature.
- M. Provide the following additional components and features:
  - 1. Provide evaporator freeze thermostat, winter start control, compressor start assist capacitor and relay, low ambient controller, and ball bearing fan motor.
  - 2. Provide expanded metal coil guard for all sides of the air cooled condensing unit. Coil guard shall be as manufactured by MicroMetl, Can-Fab, or equal.
- N. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Carrier Corporation.
  - 2. Trane Inc.
- O. Owner Training: Manufacturer shall provide one on-site 1-hour training sessions for Owners' maintenance personnel.

### **3.3 COOLING COIL**

- A. Provide direct expansion encased cooling coil.
  - 1. Install encased coil to operate properly in vertical or horizontal position as required. Construct coil with aluminum plate fins mechanically bonded in non-ferrous tubing with all joints brazed ultrasonically. Coil shall have factory-installed refrigerant metering device, refrigerant line fittings which permit mechanical connections, and condensate pan with primary and auxiliary drain connections.
  - 2. Construct casings of galvanized steel, bonderize, insulate, and finish with baked enamel.

### **3.4 REFRIGERATION PIPE AND FITTINGS**

- A. Refrigeration gas and liquid piping shall be type ACR hard drawn copper tubing, cleaned and capped in accordance with ASTM B280, with wrought copper fittings. All joints shall be brazed with Sil-fos under nitrogen purge. Relief valve discharge piping shall be full size of relief discharge port.
  - 1. Manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping may be utilized at Contractor's discretion.
    - a. Heat Pump Systems: Use of manufactured, pre-charged and pre-insulated refrigerant line-set refrigerant piping between outdoor condensing units and indoor heat recovery controllers, or distribution headers and tees is not allowed. When system manufacturer's installation instructions allow use of refrigerant line-set piping between indoor heat recovery controllers, or distribution headers and tees, and air terminal devices, follow instructions for allowable pipe size range and support to avoid forming traps in the piping.

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- B. Refrigeration Piping Specialties: Furnish and install Superior, Sporlan, Alco, Henry, or equal, stop valves, solenoid valves, adjustable thermal expansion valves, sight glass, flexible connection, charging valve, and drier with valve bypass in the liquid lines and Superior DFN shell and cartridge suction line filter sized 2-1/2 times tonnage.

- 1. Install only those refrigeration piping specialties recommended by manufacturer of specific installed equipment.

**3.5 REFRIGERANT ACCESS VALVE LOCKING CAPS**

- A. Each refrigerant circuit access valve located outside buildings, including valves located on roofs, shall be provided with a locking cap. Caps shall be of metal construction, with threaded brass inserts. Caps shall be color-coded according to ASHRAE standards for R22 and R410A refrigerant gasses, universal color for other refrigerant gasses. Caps shall be removable only with cap manufacturer's handheld tool.

- 1. Provide minimum of two (2) cap removal tools for every ten (10) air conditioning units or other systems containing refrigerant installed under this Project.

**3.6 AIR INLETS AND OUTLETS**

- A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Ceiling, wall or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.
- C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

**3.7 AIR FILTERS**

- A. Provide MERV 13 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:
  - 1. Standards:
    - a. ASHRAE Standard 52.2-2007.
    - b. Underwriters Laboratories: U.L. 900, Class 2.
  - 2. Construction:
    - a. Media: Synthetic or cotton-synthetic blend with radial pleats.
    - b. Media Frame: High wet-strength beverage board.
    - c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.
  - 3. Performance: 2" deep filter shall have a maximum initial air resistance of 0.31 inches w.g.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Camfil Farr, Inc., model 30/30.
  - 2. Flanders Corporation, model 40 LPD.
- C. Temporary (Construction Period) Filters:
  - 1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer's directions, in order to provide protection for the unit prior to occupancy by the Owner.
  - 2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.
- D. Spare Filters:
  - 1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

### **3.8 DAMPERS**

- A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.
- B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.
  - 1. Rectangular Ductwork:
    - a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.
    - b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
    - c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.
  - 2. Round Ductwork:
    - a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
    - b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches

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damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.

3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

**C. Fire Dampers and Combination Fire/Smoke Dampers:**

1. Fire dampers and combination fire/smoke dampers shall be listed and approved by the California State Fire Marshal. Installation shall conform to the manufacturer's UL approved installation instructions.
  - a. Fire dampers shall be UL 555 classified and labeled as dynamic fire dampers approved for wall and floor installation. They shall ship from the manufacturer as an assembly with a minimum 20-gauge factory installed sleeve. Sleeve length shall suit the requirements of the wall construction. Each dynamic fire damper/sleeve assembly shall ship complete with factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dynamic fire dampers for vertical installation must consist of a single section on sizes up to 33" x 36" and a single section on sizes up to 24" x 24" for horizontal installation. 1-1/2 hour dynamic fire dampers shall be Ruskin DIBD20, Pottorff, or equal. 3 hour dynamic fire dampers shall be Ruskin DIBD230, Pottorff, or equal.
  - b. Fire dampers for high pressure/velocity systems where velocities exceed 2000 fpm and/or 4" w.g. pressure fire damper shall be Ruskin FD60, Pottorff, or equal
  - c. Fire dampers for ceiling installation shall be UL 555C classified and labeled as ceiling dampers. They shall be provided with a thermal insulating blanket to fit the inlet or outlet condition if required by the application. Ceiling dampers shall be Ruskin CFD 2, 3, 4 or 5. Ceiling dampers for ceilings constructed of wood shall have UL tested in design L501 and shall be Ruskin CFD7, Pottorff, or equal.
  - d. Combination fire/smoke dampers. Dampers shall be UL classified and labeled as Leakage Class I Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall be warranted to be free from defects in material and workmanship for a period of 5 years after date of shipment. Damper/actuator assembly shall be tested to full open and full close at minimum 2000 fpm 250° F heated air and 4" w.g. with airflow in both directions. (Specified select: 250° / 350°, 2000 fpm/3000 fpm). Each damper shall be equipped with "controlled closure" quick detect heat actuated release device to prevent duct and HVAC component damage resulting from instantaneous damper closure. Release device shall be EFL type and shall allow reset from outside the sleeve after moderate temperature exposure. (Replacement type fusible links not acceptable.)
  - e. Two position combination fire smoke dampers shall be equipped with one or more factory installed, direct coupled, 120 volt, single phase, electric actuator for energize open – fail close operation. Dampers with multiple actuators shall be factory wired with single point connection at the EFL heat release device for connection to poser. Damper actuator shall include

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minimum one-year energized hold open (no cycles) and spring return (fail) close reliability. Damper/actuator shall include minimum 20,000 full open-full close cycle performances.

- f. Modulating combination fire smoke dampers shall be equipped with one or more factory installed contact for modulating signal connection. Damper/actuator shall include minimum 100,000 full open-full close cycle performances with spring return (fail) close on loss of power.
- g. Round combination fire smoke dampers up to 24" diameter shall be true round type with minimum 20 gauge galvanized steel designed for lowest pressure drop and noise performance. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. Blade seals shall be silicone edge designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17 inches minimum length and factory "roll formed" one-piece angles with pre-punched holes. Dampers shall be Ruskin FSDR25, Pottorff, or equal.
- h. Round (larger than 24" diameter) or rectangular combination fire smoke dampers shall include roll-formed structural hat channel frame, reinforced at the corners, formed from a single piece of minimum 16 gauge equivalent thickness formed from single piece galvanized steel. Bearings shall be stainless steel turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450° F and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable). Each damper shall be equipped with a factory-installed sleeve of 17" minimum length and factory "roll formed" one-piece angles with pre-punched holes for easy installation. Dampers shall be Ruskin FSD60, Pottorff, or equal.
- i. 3-hour rated combination fire smoke dampers shall be Ruskin model FSD60-3, Pottorff, or equal.
- j. All FSD60 type dampers shall be AMCA licensed and shall bear the AMCA Seal for Air Performance. AMCA certified testing shall verify pressure drop does not exceed .03" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper.
- k. Wall type fire/smoke damper:
  - 1) Combination fire/smoke dampers for use in the wall of exit corridors shall be classified and labeled as Leakage Class II Smoke Dampers in accordance with the latest version of UL 555S. Dampers shall meet the requirements for combination fire/smoke dampers in paragraph 3 above except AMCA certified testing shall verify pressure drop does not exceed .07" w.g. at a face velocity of 1,000 fpm on a 24" x 24" damper and blades shall be single skin galvanized steel 10 gauge minimum with 3 longitudinal grooves for reinforcement. Dampers shall be Ruskin FSD36, Pottorff, or equal.
  - 2) Front access combination fire/smoke dampers shall meet all the requirements for combination fire/smoke dampers in paragraph 3 above except pressure drop requirement. In addition the dampers shall be constructed so that actuators and all accessories are accessible from the grille side. Actuators and accessories shall be housed within an integral cabinet on the side of the damper frame and

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shall not be installed in the air stream in front of the damper. The damper sleeve shall be minimum 14" and flanged to accept a steel framed grille. The sleeve shall be covered with fire resistant material. Dampers shall be Ruskin FSD60FA, Pottorff, or equal.

- I. Ceiling type fire/smoke damper for tunnel type corridor construction: Combination fire/smoke dampers for use in the corridor ceiling of tunnel type corridor construction shall be UL classified and labeled as Corridor Damper. Dampers shall meet the requirements of paragraph 4a above except pressure drop testing does not require AMCA certification. Dampers shall be Ruskin FSD36C, Pottorff, or equal.
  - m. Fusible links shall have temperature rating approximately 50° F above normal maximum operating temperature of the heat producing appliance.
    - 1) If project requires re-openable fire/smoke dampers, provide Ruskin 165 ° F / 350° F TS150, NCA or equal. The TS150 firestat replaces the EFL and allows the damper to be re-opened from remote location up to 350 ° F. TS150 shall include full open and full closed damper position contacts for interface with remote position indication panel.
    - 2) Each fire/smoke damper shall be equipped with “controlled closure” quick detect heat actuated release device to prevent duct and HVAC component damage. Release device shall allow easy reset after moderate temperature rise outside the sleeve. Heat release device shall be the Ruskin EFL, NCA or equal.
    - 3) Unless the system is using a validation control system, each fire/smoke damper shall be equipped with a control panel including blade position indicator lights and a key operated switch. The panel cover shall be oversized for flush mount into the wall or ceiling and shall have a brushed look. Control panel shall be Ruskin MCP2, Pottorff, or equal.
  - 2. All actuators used for smoke dampers or combination fire/smoke dampers shall have a cycle time requirement of not more than every twelve months and shall be rated for continuous "On" duty and shall be provided with internal spring return. Actuators shall be equipped with pilot light, remote key test switch, end switch and circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper. Electric motors shall be Invensys MA-250, MA-253, Honeywell H2000, or equal.
- D. Where required to suit the size of damper required, provide manufacturers standard UL Classified mullions, arranged to support multiple dampers. Assembly shall be of minimum 16 gauge galvanized steel, complete with all accessory caps and framing members required for installation.

### 3.9 DUCTWORK

- A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.
  1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and

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install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.

2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.
3. Gauges, joints and bracing shall be in accordance with the California Mechanical Code.
4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.
  - a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
  - b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.

**B. Design and installation standards:**

1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.
2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
3. California Mechanical Code.

**C. Duct sizes indicated are external sizes.**

**D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.**

1. Provide mill certification for galvanized material at request of the Project Inspector.

**E. Duct Sealants:**

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.



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- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1) Design Polymerics, model DP1010.
  - 2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
  - 3) McGill Airseal, LLC.
- F. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
- G. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.
- H. Rectangular Duct Fabrication:
  - 1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
    - a. SMACNA HVAC Duct Construction Standards
    - b. California Mechanical Code
  - 2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

<u>Table A</u>		
<u>Duct Dimension</u>	<u>Minimum Gauge</u>	<u>Joint Reinforcement Per CMC</u>
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4

- 3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
- 4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph "DAMPERS" for damper requirements.
- 5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.

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6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.

I. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.
2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.
3. Duct Access Panels:
  - a. Provide duct access panel assembly of the same material and gauge used for the duct. Duct access panels shall conform to the following:
    - 1) Fasteners: Black steel or stainless steel to match material used for the duct. Panel fasteners shall not penetrate duct wall.
    - 2) Gasket: Comply with NFPA 96, grease-tight, high temperature ceramic fiber, rated for minimum 1500 °F.

J. Flexible Connectors:

1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - a. Minimum Weight: 26 oz./sq. yd.
  - b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
  - c. Service Temperature: Minus 50 to plus 200 deg F.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Ductmate Industries, Inc., model Proflex.
  - b. Ventfabrics, Inc., model Ventlon.

**3.10 PIPE JOINING MATERIALS**

- A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.

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**B. Brazing Filler Metals:**

1. General Duty: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
2. Refrigerant Piping:
  - a. Joining copper to copper: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
  - b. Joining copper to bronze or steel: AWS A5.8, Bag-1, silver alloy unless otherwise indicated.

**3.11 INSULATION MATERIALS**

**A. General:**

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

**B. Insulation Materials:**

1. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) Aeroflex USA, Inc.
    - 2) Armacell LLC.
    - 3) K-Flex USA.
2. Mineral-Fiber, Preformed Pipe Insulation:
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) Johns Manville; a Berkshire Hathaway company.
    - 2) Knauf Insulation.
    - 3) Manson Insulation Inc.
    - 4) Owens Corning.

- b. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.
- 3. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) CertainTeed Corporation.
    - 2) Johns Manville.
    - 3) Knauf Insulation.
    - 4) Owens Corning.

**3.12 FIELD APPLIED JACKETS:**

- A. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 2. Johns Manville, model Zeston, with Zeston 2000 fitting covers.
  - 3. Proto Corporation, model LoSmoke.
- B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Childers Brand; H. B. Fuller Construction Products.
    - b. ITW Insulation Systems; Illinois Tool Works, Inc.
    - c. RPR Products, Inc.
  - 2. Finish and thickness are indicated in field-applied jacket schedules.
  - 3. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
  - 4. Factory-Fabricated Fitting Covers:
    - a. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - b. Tee covers.
    - c. Flange and union covers.
    - d. End caps.
    - e. Beveled collars.
    - f. Valve covers.

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- g. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

**3.13 TEMPERATURE CONTROL SYSTEM**

- A. Refer to Section 23 0900, Pelican Control System for HVAC to match District Standards.

**PART 4 - EXECUTION**

**4.1 ROOF MOUNTED EQUIPMENT INSTALLATION**

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.
- B. Examine rough-in for roof mounted equipment to verify actual locations of piping and duct connections prior to final equipment installation.
- C. Verify that piping to be installed adjacent to roof mounted equipment allows service and maintenance.
- D. Install ducts to termination at top of roof curb and install heavy duty rubber gaskets on supply and return openings and on full perimeter of curb, or as required for an airtight installation, prior to setting unit on curb.
- E. Cover roof inside each roof mounted air conditioning unit, heat pump unit, and heating and ventilating unit roof curb with 2 inch thick, 3 pound density fiberglass insulation board.
- F. Connect supply and return air ducts to horizontal discharge roof mounted equipment with flexible duct connectors. Provide G 90 galvanized steel weather hood over flexible connections exposed to the weather. Weather hood minimum gauge shall be per PART 2 article, Ductwork, Table A.
- G. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

**4.2 SPLIT SYSTEM AC, AND HEAT PUMP SYSTEMS INSTALLATION**

- A. General:
  - 1. Install units level and plumb.
  - 2. Install evaporator-fan components as detailed on Drawings.
  - 3. Install ground or roof- mounted condensing units as detailed on Drawings.
  - 4. Install seismic restraints as required by applicable codes. Refer to Article, Submittals, in Section 23 0050, Basic HVAC Materials and Methods, for delegated design requirements for seismic restraints.
  - 5. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
  - 6. Install cooling coil condensate primary drain pan piping, and overflow, if provided, and run to nearest code-compliant receptacle, or as indicated on Drawings. Install

secondary drain pan for units installed over permanent and suspended-tile ceilings. Install secondary drain pan piping and terminate 1/2 inch below ceiling, with escutcheon, in a readily visible location or as shown on Drawings.

7. Install air filters at each indoor unit. Install washable, permanent filters at indoor units designed to accept washable, permanent filters. Refer to Drawings schedule, and Article, Air Filters, in this Section, for filter requirements for ducted, above-ceiling units incorporating mixing boxes.
8. Duct Connections: Duct installation requirements are specified in Article, Ductwork, in this Section. Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Article, Ductwork, in this Section.

#### **4.3 REFRIGERANT PIPING INSTALLATION**

**A. General:**

1. Install refrigerant piping according to ASHRAE 15. Install and connect refrigerant piping as detailed in unit manufacturers' literature. Install piping to allow access to unit.
2. Install piping straight and free of kinks, restrictions or traps.
3. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
4. Slope horizontal suction piping 1 inch/10 feet towards compressor.
5. Install fittings for changes in direction and branch connections.
6. Piping under raised floors shall be kept 6 inches minimum above ground; excavate as necessary.
7. Install locking caps on refrigerant access valves located outside building, including valves located on roofs.
8. Insulate refrigerant piping, including liquid and hot gas pipes when required by system manufacturer, and including headers, branches, and other components as detailed in unit manufacturers' literature.

**B. Factory Pre-charged and sealed line set piping:**

1. Keep the entire system clean and dry during installation.
2. All tubing shall be evacuated and sealed at the factory. The seal must not be broken until ready for assembly.
3. If there is any evidence of dust, moisture, or corrosion, the tubing must be cleaned out by drawing a swab soaked with methyl alcohol through the tubing as many times as necessary to thoroughly clean the tubing.
4. Where line set piping is used, enclose in iron or steel piping and fittings or in EMT conduit.

**C. Field Assembled Refrigerant Piping:**

1. Select system components with pressure rating equal to or greater than system operating pressure.

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2. Where subject to mechanical injury, enclose refrigerant piping in EMT conduit.
3. Where field assembled refrigerant piping is exposed mounted at grade, on walls, and on roof, enclose in 16 gage galvanized steel enclosure.
4. When brazing, remove solenoid valve coils and sight glasses, also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

**4.4 FAN INSTALLATION**

- A. Ceiling Mounted Fans: Mount variable speed switch within fan housing. Mark final balance point on variable speed switch.
- B. Provide access doors for fans or motors mounted in ductwork.
- C. Mount all fans as detailed on Drawings and in compliance with CBC standards.
- D. Fan motors mounted in air-stream to be totally enclosed.
- E. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.
- F. Roof fans shall be mounted level.
- G. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

**4.5 AIR INLETS AND OUTLETS INSTALLATION**

- A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
- B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.
- C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.
  1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
  2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.

3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.
- D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.
- E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

#### **4.6 FILTER HOUSING INSTALLATION**

- A. Mount filters in airtight galvanized steel housings furnished by the filter manufacturer, or shop-fabricated. Housings shall incorporate integral tracks to accommodate filters, and flanges for connection to duct or casing system.
  1. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames and to prevent bypass of unfiltered air.
  2. Access Doors: Hinged, with continuous gaskets on perimeter and positive-locking latch handle devices.
- B. Air filters shall be accessible for cleaning or replacement.
- C. Identify each filter access door with 1/2 inch high minimum stenciled letters.

#### **4.7 TEMPORARY FILTERS**

- A. Provide temporary filters for fans that are operated during construction; after construction dirt has been removed from the building install new filters at no additional cost to the Owner. In addition to temporary filters at filter location, provide temporary filters on all duct openings which will operate under a negative pressure.
  1. Filters used for temporary operation shall be the same as permanent filters for the application. Filters used for duct openings may be 1 inch thick pleated media disposable type.

#### **4.8 DAMPER INSTALLATION**

- A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.
- B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.
- C. Install fusible link fire dampers full size of duct at points where shown or required.
- D. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.



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1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

**4.9 DUCTWORK INSTALLATION**

- A. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.
- B. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealer shall be fire retardant. Sheet metal screw for joints shall be minimum #10 size galvanized.
- C. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw

- D. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger

- E. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.
- F. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.

1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.

#### **4.10 PIPE JOINTS AND CONNECTIONS**

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Copper Pipe and Tubing: All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except pneumatic control piping, and hydronic piping having grooved-end fittings and couplings.

C. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
3. Anchor piping securely on the system side of each flexible connection.

#### **4.11 INSULATION AND FIELD-APPLIED JACKET INSTALLATION**

A. General:

1. The term "piping" used herein includes pipe, air separators, valves, strainers and fittings.
2. Test insulation, jackets, and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723, ASTM E84, or NFPA 255.
3. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
4. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, ductwork, and equipment.
5. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.

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6. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
7. Install insulation with longitudinal seams at top and bottom of horizontal runs.
8. Install multiple layers of insulation with longitudinal and end seams staggered.
9. Keep insulation materials dry during application and finishing.
10. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
11. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
12. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
13. For piping, ductwork, and equipment, with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
14. Repair all damage to existing pipe, duct and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.
15. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - a. Install insulation continuously through hangers and around anchor attachments.
  - b. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - c. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - d. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

**B. Piping Insulation Installation:**

1. General:
  - a. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - b. Provide removable insulation covers for items requiring periodic service or inspection.
  - c. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation.
  - d. Provide pre-formed PVC valve and fitting covers for indoor piping.

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- e. Provide factory-fabricated aluminum valve and fitting covers for outdoor piping.
    - f. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
  - 2. Below-Ambient Services Including Chilled Water Supply and Return and Refrigerant Piping:
    - a. Insulate valves and irregular surfaces to match adjacent insulation and cover with two layers of woven glass fiber cloth saturated in Foster Sealfas 30-36, 3M, or equal, extending 3 inches over the adjoining pipe insulation. Finish with a coat of Foster Sealfas 30-36, 3M, or equal. The 3 inch wide SSL end laps furnished with the insulation shall be adhered over the end joints. Seal entire surface of insulation vapor tight, including joints and ends of PVC or aluminum fitting covers.
    - b. Variable refrigerant flow (VRF) heat pump systems: Insulation for VRF system refrigerant piping shall be installed according to VRF unit manufacturer's instructions.
  - 3. PVC Jacket Installation:
    - a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
      - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
  - 4. Aluminum Jacket Installation:
    - a. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.
- C. Duct Insulation Installation:
- 1. General:
    - a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
    - b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.

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- c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.
  - 2. Mineral Fiber Blanket Installation:
    - a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.
  - 3. PVC Jacket Installation:
    - a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
      - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Equipment Insulation Installation:
- 1. General:
    - a. Insulate pumps, coil u-bends where exposed outside airstream, air separators, heating hot water and chilled water storage tanks, and other elements that are in series with the fluid flow, according to the requirements of the California Energy Code.
  - 2. Mineral-Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.
    - a. Apply adhesives according to manufacturer's recommended coverage rates per unit area, and for percent coverage of tank and vessel surfaces.
    - b. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
    - c. Protect exposed corners with secured corner angles.
    - d. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
      - 1) Do not weld anchor pins to ASME-labeled pressure vessels.
      - 2) Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
      - 3) On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
      - 4) Do not overcompress insulation during installation.
      - 5) Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.

- 6) Impale insulation over anchor pins and attach speed washers.
- 7) Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
- e. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
- f. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
- g. Stagger joints between insulation layers at least 3 inches.
- h. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
- i. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
- j. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
3. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
  - a. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
  - b. Seal longitudinal seams and end joints.

#### **4.12 DUCTWORK SEALING AND LEAK TESTING**

- A. All ductwork shall receive a Class A seal.
- B. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in conditioned space.
- C. Leakage Classes:

<u>Pressure Class</u>	<u>Leakage Class</u>	
	<u>Round Duct</u>	<u>Rectangular Duct</u>
2"W.G. or less	8	16
4"W.G. or greater	2	4

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- D. All duct systems (supply, return, outside air intake, and exhaust), except those identified on compliance forms on Drawings as requiring Acceptance Testing per the requirements of the California Energy Code, shall be tested in accordance with the requirements of SMACNA "HVAC Air Duct Leakage Test Manual." Test pressure shall be equal to the pressure class of the duct. For additional duct leak testing requirements, refer to Section 23 0800.13, "Title 24 Commissioning of HVAC."

**4.13 TEMPERATURE CONTROL SYSTEM INSTALLATION**

- A. Provide thermostats where indicated on drawings. All wiring shall be in conduit. Provide all relays, transformers and the like to render the control system complete and fully operable. All control conduit to be rigid steel type. System shall be Pelican to match District Standards.

**4.14 EQUIPMENT START-UP**

- A. Initial start-up of the systems and pumps shall be under the direct supervision of the Contractor.
- B. Equipment start-up shall not be performed until the piping systems have been flushed and treated and the initial water flow balance has been completed.
- C. It shall be the responsibility of the Contractor to assemble and supervise a start-up team consisting of controls contractor, start-up technician, and test and balance contractor; all to work in concert to assure that the systems are started, balanced, and operate in accordance with the design.
- D. After start-up is complete, instruct the Owner's personnel in the operation and maintenance of the systems. Obtain from the Owner's representative a signed memo certifying that instruction has been received.
- E. For additional requirements, refer to article, Check, Test and Start Requirements, in Section 23 0050, Basic HVAC Materials and Methods.

**4.15 TESTING AND BALANCING**

- A. For testing and balancing requirements, refer to Section 23 0593, Testing and Balancing for HVAC.

**4.16 CLEANING AND PROTECTION**

- A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.
- B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.
- C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.

- D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

#### **4.17 EQUIPMENT MOUNTING**

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

#### **4.18 INDOOR PIPING INSULATION SCHEDULE**

- A. Refrigerant Piping:
  - 1. All pipe sizes: Insulation shall be one of the following:
    - a. Suction piping smaller than 1-1/2 inches diameter:
      - 1) Flexible Elastomeric: 1/2 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1/2 inch thick.
    - b. Suction piping 1-1/2 inches diameter and larger:
      - 1) Flexible Elastomeric: 1 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1 inch thick.
    - c. Suction piping for heat pump applications smaller than 1 inch diameter:
      - 1) Flexible Elastomeric: 1 inch thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1 inch thick.
    - d. Suction piping for heat pump applications 1 inch and larger:
      - 1) Flexible Elastomeric: 1-1/2 inches thick.
      - 2) Mineral-Fiber, Preformed Pipe: 1-1/2 inches thick.
  - 2. When equipment manufacturers' instructions indicate that refrigerant liquid and hot-gas gas piping be insulated, insulation thickness shall be equal to, and applied as described herein for refrigerant suction piping.

#### **4.19 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

- A. Refrigerant Suction and Hot-Gas Piping:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Flexible Elastomeric: 1-1/2 inches thick.
    - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.
  - 2. When equipment manufacturers' instructions indicate that refrigerant liquid piping be insulated, insulation thickness shall be equal to, and applied as described herein for refrigerant suction piping.

#### **4.20 INDOOR FIELD-APPLIED PIPING JACKET SCHEDULE**

- A. Piping, concealed: None.
- B. Piping, exposed: PVC, 20 mils thick.



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**4.21 OUTDOOR FIELD-APPLIED PIPING JACKET SCHEDULE**

- A. All Piping: Aluminum, Stucco Embossed: Thickness as follows:

<u>Outer Insulation Diameter (Inches)</u>	<u>Minimum Aluminum Jacket Thickness (Inch)</u>	
	<u>Rigid Insulation</u>	<u>Non-Rigid Insulation (Note 1)</u>
8 and Smaller	0.024	0.024

1. Note 1: Non-rigid Insulation is defined as having a compressive strength of less than 15 psi.

**4.22 INDOOR DUCT INSULATION SCHEDULE**

- A. Minimum R-Value = R-4.2.
- B. Supply and Return Ducts: Mineral Fiber Blanket, 1-1/2 inches thick, 0.75 lb/cu. ft.

**4.23 OUTDOOR DUCT INSULATION SCHEDULE.**

- A. Refer to article, Ductwork, for double-wall ductwork with interstitial insulation.

**4.24 INDOOR FIELD-APPLIED DUCT JACKET SCHEDULE**

- A. Insulated ducts in concealed spaces: None.
- B. Insulated ducts in exposed unconditioned spaces: PVC, 20 mils thick.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 CONDITIONS OF THE CONTRACT**

- A. The Conditions of this Contract (General, Supplementary, and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of this Section.
- B. Division-15 Mechanical sections apply to work of this section.

### **1.2 WORK INCLUDED**

- A. Types of Multizone Units required for project include the following: Modular-Split System - Penthouse
- B. MANUFACTURER: Subject to compliance with requirements, provide multizone units of the following manufacturer or Owner pre-approved equal, prior to bid:
  - 1. Custom Mechanical Equipment, Inc.
- C. Refer to drawings in this bid set for units to be provided.

### **1.3 QUALITY ASSURANCE**

- A. FLAME-SMOKE RATINGS: Except as otherwise indicated, provide thermal insulation with flame- spread index of 25 or less, fuel-contributed index of 50 or less, and smoke-developed index of 50 or less.
- B. AMCA STANDARDS: Comply with Air Movement and Control Association (AMCA) Standards as applicable to testing and rating fans.
- C. SMACNA COMPLIANCE: Comply with Sheet metal and Air-Conditioning Contractors National Association (SMACNA) ductwork construction standards as applicable to multizone units.
- D. ETL, AGA, & UL COMPLIANCE: Provide electric components for multizone units which have been listed and labeled by Underwriters Laboratories or by a testing organization of equal standing.
- E. ENERGY STAR LABEL: Provide written confirmation of listing of all furnaces in the "Directory of Certified Gas Fan-Type Central Furnaces", and furnaces must have the Energy Star® label.

### **1.4 SUBMITTALS**

- A. PRODUCT DATA: Submit manufacturer's specifications for multizone units showing dimensions, weight, capacities, ratings, certified fan performance with operating point clearly indicated, motor electrical characteristics, gauges and finishes of materials, and installation instructions.

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- B. **MAINTENANCE DATA:** Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals only.

**PART 2 - MATERIALS**

**2.1 SPLIT SYSTEM HVAC UNITS**

- A. **GENERAL:** Furnish and install multizone systems, complete with Open Protocol Direct Digital Controls, by Alerton or Owner pre-approved equal. The units shall be a standard product of a firm regularly engaged in the manufacture of heating/cooling equipment. The equipment shall be shipped completely factory tested and internally ready for field connections. Provide thermal overload protected motors.
1. All wiring shall be in compliance with NEC.
- B. **HEATING/COOLING SYSTEM:** The total certified heating/cooling capacity shall not be less than scheduled. The compressor power input shall not exceed that of the unit specified.
- C. **SPECIFIED EQUIPMENT:** Approved equipment must include multiple independent heating, cooling, fan and economizer sections to provide system redundancy, improve reliability, increase system efficiency, and reduce energy usage. Equipment that requires reheat will not be acceptable. Any manufacturer not meeting these specifications must provide a detailed explanation of the deviation(s) from the specifications and all performance information necessary for the owner to complete a comparative life cycle cost analysis. The Owner reserves the right to reject any bids not meeting all specifications.
- D. **TECHNICAL SPECIFICATIONS:** The gas fired multizone units shall be factory assembled one- piece penthouse design and be listed by ETL as an approved HVAC appliance. The following components shall be factory installed, wired and plumbed inside the penthouse:
1. High efficiency two-stage, heating section (minimum 95% AFUE)
  2. Evaporator coils
  3. Fully modulating economizer dampers
  4. Low voltage control center
  5. Line and low voltage wiring in the penthouse
  6. Gas lines with single point exterior connection
  7. Condensate piping to single point interior connection
  8. Refrigerant piping to exterior of penthouse
  9. Combustion intake and exhaust piping to termination point
  10. Supply air zone head matching existing ductwork
  11. Interior lights and ground fault convenience outlet
  12. 30% efficient 2" MERV13 pleated filters
  13. Barometric pressure relief dampers

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14. Condenser rails for mounting condensers
  15. Main exterior electrical disconnect switch
  16. Step-down transformers
  17. Phase Protection
  18. Open protocol DDC Controller – BacNet Web Ready
- E. **STRUCTURE AND INSTALLED COMPONENTS:** Penthouse shall be constructed of coated, high ribbed galvanized steel siding and trim (25 year performance warranty) with R-9 insulation. Standard color is burnished slate. All louvers shall be coated to match the penthouse with integral bird screen. Unit base shall be designed to set on existing roof curbs and use existing ducts without the need for any transition curb or ducts. Lifting lugs shall be provided for rigging.
- F. **SERVICE ACCESS:** All components, wiring, and inspection areas shall be completely accessible through removable panels or doors.
- G. **HEATING:** Heating shall be high efficiency two stage condensing type, utilizing outside air for combustion. Units shall be certified with AGA laboratories and the ratings certified by GAMA, tested according to DOE test procedures and FTC labeling regulations. Unit shall be available for use with LPG/propane as an option. The units shall be Lennox EL296UH090XV60C with A.F.U.E. of 96.0%.
- H. **SUPPLY AIR FAN:** An independent, 1 Hp fan section is required for each heating section. Each blower assembly shall be statically and dynamically balanced. Maximum speed is 1100 RPM. Blower speed shall be reduced a minimum of one third of the design rotational speed to lower energy costs and reduce drafts when space conditions allow. Fan speed must be adjustable through digital blower balancing control within the user interface or the BAS. Change in blower speed must be gradual utilizing a VSM (DC) motor or Variable Frequency Direct Drive. Control sequence and equipment must be pre-approved by the Owner. Belt-driven fans shall not be acceptable. The entire assembly shall be resiliently rubber mounted.
- I. **COOLING:**
1. An independent, direct expansion single-stage cooling system shall be provided for each heating section. Evaporator coils shall be made with seamless copper tubing, aluminum fins mechanically bonded to durable copper tubes, and galvanized steel frame. Balanced port, adjustable thermal expansion valves shall be factory-installed. Refrigerant shall be R-410a. Each coil shall be thoroughly tested under high pressure and charged with nitrogen prior to shipment to further assure leak-proof construction.
  2. An independent air-cooled condensing unit shall be provided for each cooling coil. Units shall be set directly on the roof or on the existing roof curb using devices provided by the manufacturer.
  3. Condenser fan shall be TEFC, permanently lubricated direct drive motor with vertical discharge, rain shield and louvered steel top fan guard. All refrigerant piping shall be type "L" hard drawn refrigerant grade copper tubing. Backseating brass service valves shall provide access to refrigerant system. Field installed piping shall be as required by the manufacturer.

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4. Condenser coil is to be factory tested to insure leak-proof construction. Entire coil shall be accessible for cleaning. Refrigerant compressor shall be a Copeland Compliant Scroll. Unit shall be rated for a minimum 11.3 EER at ARI conditions with the evaporator coil and condenser section provided. The compressor shall be resiliently mounted, have built-in crankshaft lubrication, crankcase heater, discharge temperature limited, and current-and temperature- sensing motor overloads.
  5. The system shall be protected by high and low pressure switches and a five-minute compressor timed off cycle controller (anti-recycle timer).
  6. Unit Casings: Design for outdoor installation and provide weather protection for components and controls and have a PVC coated steel wire coil guard.
- J. ECONOMIZERS: An independent economizer section shall be provided for each heating section. Units shall be fully modulating with enthalpy or dry-bulb changeover and a manually adjustable minimum damper position. Outdoor air intake damper leakage shall not exceed three cfm/sq. ft. at 3" static pressure differential across the damper.
- K. FILTERS: Sufficient surface area on 2" pleated, 30% efficient filters shall be provided (Farr 30/30 or equivalent). All air shall pass through these filters prior to entering any fan, coil or heat exchanger.
- L. UNIT CONTROL – DDC CONTROLLER SPECIFICATION:
1. The controller used shall be 32-bit microprocessor based and graphically programmable to control each unit with 148 input/output (I/O) points:
    - a. Up to 76 universal inputs (individually jumper-selectable to select either a dry contact, thermistor, 0-20 mA, 0-5 VDC, 0-10 VDC, or RTD...with 12-bit resolution on all analog inputs)
    - b. Up to 40 digital outputs (relayed outputs with individual LED indication and individual HOA switches)
    - c. Up to 40 analog outputs (0-10 VDC or 0-20 mA)
  2. Capacity requirements greater than 148 I/O's can be added as an option. The maximum number of inputs and outputs the controller can accept is 180 (92 universal inputs, 48 digital outputs and 48 analog outputs).
  3. The controller must be capable of sensing CO2 levels by zone and modulating the fresh air by zone to established levels if required.
  4. There shall be no limits on the number of control loops that the controller can handle nor any programming limitations imposed. The controller shall have an on-board, jumper-selectable EIA-232 or EIA-485 open protocol port that supports the following communication protocols: BACnet (modes supported: MS/TP, PTP, and ARCnet), Modbus (modes supported: RTU and ASCII), N2 Bus, and LonWorks. If a controller does not support all of these protocols, then the equipment manufacturer shall include and provide in their price all of the necessary additional communication gateway(s) to support all of these protocols.
  5. All programming memory shall be stored in 16 MB non-volatile battery-backed RAM (with 12 MB available for use), 8 MB Flash Memory and 32-bit memory bus, thus requiring no battery-backup and providing for rugged electrical noise immunity. The controller shall contain an on-board battery- backed (up to 10

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years) hardware clock for stand-alone scheduling capability and accurate recording of date/time on alarm events and data logging. The time/date maintained by the hardware clock shall automatically adjust for daylight savings time and leap years.

6. As simple-to-use keypad/display (KPD) unit with a minimum 4 line by 40 characters per line backlit LCD with 22 function buttons will be supplied with each unit. Software and hardware features of the KPD shall include:
  - a. Custom definable displays and menus.
  - b. Alarm indicator light and horn as well as an acknowledge (or "mute") button. The alarm light shall be active anytime there is an active alarm, and the alarm horn shall be active anytime there is an active, unacknowledged alarm. It shall be software selectable which individual alarm conditions, if any, that activate the horn.
  - c. Alarm history buffer displaying the 64 most recent alarms, including custom alarm text and time stamping of time of alarm occurrence and time when the alarm condition returned-to-normal.
  - d. User password protection for KPD editing access as well as separate technician password protection.
  - e. View and adjustment of operating schedules – normal, holiday, and override schedule modes.
  - f. Ability to connect or disconnect the KPD "on-the-fly" without the need to cycle power to the controller for the KPD to be fully functional.
  - g. Option to mount the KPD component itself up to 1,500 feet away from the unit.
  - h. Ability to reset the controller's time/date.
  - i. Ability to field-adjust through the KPD which protocol the controller communicates through its open protocol port as well as the ability to adjust certain protocol parameters (such as baud rate, stop bits, parity, protocol mode, etc.).
- M. DUCT SYSTEM: Unit shall have factory-installed internal duct system. Individual zone heads shall be sized and located for connection to the existing zone systems. The return air opening shall include a protective grate. Zone balance dampers shall be provided when required to allow aggregate balancing of each zone on the building roof. Sub-zone control dampers actuators shall be easily accessible through external access panels without removing any screws, bolts, etc.
- N. ELECTRICAL: 460 volt, three phase with main over current protection device and branch circuit breakers shall be provided in each unit. Condensing unit disconnect switches shall be mounted on the exterior of the penthouse adjacent to the respective condensing units. A main electrical disconnect switch shall be factory mounted on each unit. Unit shall include a factory-installed power quality monitor to disable unit during phase loss, high voltage or low voltage conditions.
- O. WARRANTIES: The unit shall include the following manufacturer's parts only warranties with no labor allowance unless noted:
  1. Heat exchangers shall have a ten-year limited warranty with 50 °F minimum inlet air.

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2. Solid-state ignition modules shall have a one-year limited warranty.
3. Blower motors shall have a limited one-year warranty.
4. The compressor shall have a limited five-year warranty.
5. All other covered components shall have a limited one-year warranty.

**P. EQUIPMENT MANUFACTURER REQUIREMENTS:**

1. Inspect existing equipment and site prior to construction.
2. Complete system design to match equipment with building requirements.
3. Provide customized submittal data matching job requirements.
4. Fabricate all equipment in accordance with job schedule.
5. Control equipment delivery to meet schedule requirements.
6. Provide a project manager to supervise the installation.
7. Start-up equipment with the assistance of the installing contractor.
8. Complete detailed training of system operation, maintenance and troubleshooting for the owner.
9. Provide Operating and Maintenance instructions, including color-coded unit wiring diagrams showing actual wiring colors.

**PART 3 - EXECUTION**

**3.1 INSPECTION**

- A. Examine areas and conditions under which multizone units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

**3.2 INSTALLATION OF MULTIZONE UNITS**

- A. Install multizone units where indicated, in accordance with equipment manufacturer's instructions with unsatisfactory conditions corrected.
- B. Factory mounted integral disconnect switches shall be provided for all units.

**3.3 TESTING**

- A. Upon completion of installation of multizone units, start up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.

**3.4 CLEANING UP**

- A. Upon completion of work, remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Furnish and install all necessary labor, materials, tools and equipment to perform and completely finish the work according to the intent of this specification, and the accompanying drawings.
- B. Furnish and install any incidental work which can reasonably be inferred as required and necessary to provide complete and workable systems.
- C. Provide connections of all equipment specified under these sections and other Divisions including Divisions 22 (Plumbing) and 23 (HVAC) including installation and connection of all motors, relays, remote starters, etc.
- D. The requirements of the General and Supplemental Conditions, and Division 01 apply to Divisions 26, 27 and 28, and these specifications. All sections in Divisions 26, 27, and 28 are interrelated. Work specified in other sections, as applicable, shall apply to all work hereunder.

**1.2 LOCAL CONDITIONS**

- A. Examine site; verify dimensions and locations against drawings and become informed of all conditions under which work is to be done before submitting proposal. No allowance will be made for extra expenses because of omission on Contractor's part to include cost of work under prevailing conditions.
- B. Information shown relative to services is based upon available records and data shall be regarded as approximate only. Minor deviations found necessary to conform with actual locations and conditions shall be made without extra cost.
- C. Extreme care shall be exercised in excavating near existing utilities to avoid any damage thereto. It shall be the contractor's responsibility to verify existing underground utilities prior to digging anywhere. Information provided on these plans indicating existing conditions shall only be used as reference, and shall not be deemed considered accurate. Any damage to existing utilities done by the contractor shall be repaired and/or replaced by the contractor at their expense to its pre-damage condition.

**1.3 PERMITS AND INSPECTIONS**

- A. Obtain and pay for all permits and service charges required in installation of the work. Arrange for required inspections and secure approvals from authorities having jurisdiction.
- B. During its progress, work shall be subject to inspection by Project Inspector.



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**1.4 CODES AND STANDARDS**

- A. Work and materials shall be in full accordance with California Occupational Safety Health Act (CAL-OSHA), California Electrical Code (CEC), State Fire Marshal, Electrical Safety Orders (Title 8, Subchapter 5), the National Fire Protection Association, California Building Code (CBC); California Code of Regulations - Title 24 and other applicable State or local laws or regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes.
- B. Electrical materials shall bear the label of, or be listed by, the Underwriter's Laboratories (UL) unless of a type for which label or listing service is not provided.
- C. Materials and components shall conform to Industry Standards, including:
  - 1. NEMA - National Electrical Manufacturer's Association
  - 2. ANSI - American National Standards Institute
  - 3. ASTM - American Society for Testing Material Association
  - 4. IPCEA - Insulated Power Cable Engineer's Association
  - 5. CBM - Certified Ballast Manufacturers
- D. When Contract Documents differ from governing codes, furnish and install larger size or higher standards called for without extra charge.

**1.5 REVIEW OF MATERIALS**

- A. Prior to commencement of Work and within 35 days after award of contract, submit for approval in accordance with General Conditions all equipment and materials to be furnished.
  - 1. Equipment/Product submittals shall be bound and indexed and shall include a table of contents listing all equipment submitted. The table of contents shall include: Project designation, submittal number, submittal name including specification section, date, and include manufacturer, model number, reference specification paragraph or sheet detail number, description, and page location. Where a group or series of products are submitted, each item does not have to be listed; only the series need to be identified. Example:

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Project:

Submittal No.

Submittal Name:

Date:

Spec para.,

Page(s)	Manufacturer	Model No.	Detail No.	Description
1-12	XYZ Corp	123ABC	2.5	Control panel
13,14	XYZ Corp	456DEF	2.6-A	Power supply
15	ABC Corp	789GHK	A/E9.5	Rack
16,17	Cantex	PVC-40	2.1	PVC conduit
18	Steel City	XYZ series	2.2	Steel fittings

2. Shop drawings submittals shall be neat and professionally done using CAD (computer aided drafting), hand-drawn submittals will not be accepted. Shop drawings shall have sufficient information to clearly indicate work to be performed and be complete including device/equipment locations, wire sizes, wire types and number of wires, symbol list or legend, point-to-point connections, wiring diagrams, and equipment anchorage detail where needed. Shop drawings shall utilize the same size paper as the Bid set of plans.

**B. Substitutions:**

1. Only one request for substitution will be considered on each item of material or equipment. No substitutions will be considered thereafter. Substitutions will be interpreted to be all manufacturers other than those specifically listed by model or catalog number. Should the original submittal of a proposed substitution be rejected, the specified item shall be furnished.
2. Submit complete information or catalog data to show equality of equipment or material offered to that specified. Identify which product is being substituted in the specifications and/or the plans and provide analysis as indicating either it "Complies" or that it "Does Not Comply" and providing a reason. Each Specification paragraph shall be provided with this analysis. No substitutions will be allowed unless requested and approved in writing. Materials of equal merit and appearance, in the opinion of the Engineer, will be approved for use. Engineer reserves the right to require originally specified item.
3. Acceptance of a substitute is not to be considered a release from the Specifications. Any deficiencies in an item, even though approved, shall be corrected by the Contractor at his expense.

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- 4. Responsibility for installation of approved substitution is included herein. Any changes required for installation of approved substituted equipment shall be made without additional cost to Owner.
- C. Where it is in the best interest of the Owner, Engineer may give written consent to a submittal received after expiration of designated time limits, or for an additional resubmittal.
- D. Submit for approval in ample time to avoid delay of construction, shop drawings or submittals on all items of equipment and materials covered in list mentioned above. Submit in accordance with General Conditions in a complete package; partial submittals will not be considered.
- E. Failure to comply with any of the preceding requirements will necessitate that the specified materials be submitted and supplied.

**1.6 RECORD DRAWINGS**

- A. Upon completion of Work, furnish Engineer with AutoCAD file, PDF file, and one printed full size hardcopy upon which shall be shown all Work installed under contract including any Work which are not in accordance with Original Contract Drawings. AutoCAD files shall be 2004 or later version, with external references bound to its parent drawing. Provide a separate PDF file for each sheet, do not combine all sheets into a single file. Furnish digital files on a USB flash drive or CD.
  - 1. The above shall also include shop drawings.
- B. All symbols and designations used in preparing Record Drawing shall match those used in Contract Drawings.
- C. Show all buried and concealed conduit, stub-outs, etc. Locate all buried conduit and stub-outs by dimensions from permanent, easily located and identifiable portions of structure; also, dimension ends of stub-outs, etc. Note depth of buried items below grade.

**1.7 ADDENDA AND CHANGE ORDERS**

- A. Changes in the plans and specifications shall be made by Addenda or Change Orders signed by the Engineer.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Materials mentioned herein or on drawings require that each item listed be provided and of quality noted, or an approved equal. All material shall be new, full weight and standard in all respects and in first-class conditions. Where possible, all materials used shall be of the same brand or manufacturer throughout for each class of material or equipment.

- B. Grade or quality of materials desired is indicated by trade names or catalog numbers stated herein. Dimensions, sizes and capacities shown are a minimum and shall not be changed without permission of Engineer.

### **PART 3 - EXECUTION**

#### **3.1 DRAWINGS AND COORDINATION**

- A. Examine Drawings and Site; be familiar with types of construction where electrical installation is involved. Work shall be neatly installed in a workmanlike manner in accordance with NECA Standard of Installation. Work shall be coordinated with other trades to avoid conflicts. Clarifications will be made by Engineer and minor adjustments shall be made without additional cost to Owner. Obtain ruling from Engineer concerning any obvious discrepancies or omissions in work before bidding. All work involved in correcting obvious errors or omissions after award of Contract shall be performed as directed by Engineer without additional cost to Owner.
- B. Layouts of equipment, accessories and wiring systems are diagrammatic (not pictorial), but shall be followed as closely as possible. Drawings and Specifications are for assistance and guidance, and exact locations, distances, levels, etc., will be governed by Site.
- C. All equipment (devices, conduits, boxes, etc.) shall be flush or semi-flush mounted unless otherwise noted. Where conditions do not allow flush mounting and where acceptable to the Architect, equipment may be surface mounted.

#### **3.2 WORKING SPACE**

- A. Provide adequate working space around electrical equipment in compliance with Article 4 of Electrical Safety Orders. In general, provide 36 inches minimum clear work space in front of panelboards and controls of 120/208 volt systems and 42 inches minimum for 277/480 volt systems.

#### **3.3 CARE AND CLEANING**

- A. All broken, damaged or otherwise defective parts shall be repaired or replaced without additional cost to Owner. Work shall be left in a condition satisfactory to Engineer. At completion, carefully clean and adjust all equipment, fixtures and trim installed as part of this work. Systems and equipment shall be left in a satisfactory operating condition.
- B. All surplus materials and debris resulting from this work shall be cleaned out and removed from site; this includes surplus excavated material.

#### **3.4 EXCAVATING AND BACKFILLING**

- A. Excavate and backfill as required for installation of electrical work. Restore all surfaces, roadways, sod, walks, curbs, walls, existing underground installation, etc., cut by installations to original condition in an acceptable manner. Maintain all warning

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signs, barricades, flares and lanterns as required by the Safety Orders and local ordinances.

- B. Excavation: Dig trenches straight and true to line and grade, with bottom clear of any rock points. Minimum conduit depth of pipe crown shall be 24 inches below finished grade.
- C. Backfill: Support conduits with 2" sand bedding at bottom of trench. Provide sand backfill from bottom to 12" below finished grade. The top 12" to be local fine earth material free of rubble, rubbish or vegetation. Trenches shall be backfilled and compacted to 90% (per ASTM D1557) of maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

**3.5 PROTECTION**

- A. In performance of work, protect work from damage. Protect electrical equipment, stored and installed, from dust, water or other damage.

**3.6 EQUIPMENT IDENTIFICATION**

- A. Panelboards, remote control switches, terminal boxes, etc., shall be properly identified with a descriptive nameplate. Nameplate shall be made of 3/32 inch laminated plastic with black background and white letters. Size of letters shall be 1/4 inch high for equipment in device box or boxes 12" or smaller, and 1/2 inch high for panelboard, terminal can, or larger items. Letters shall be machine engraved. Punched strip type nameplates and cardholders in any form are not acceptable. Nameplates shall be attached with oval head machine screws tapped into front panel.
- B. Indicate type of equipment and equipment designation, ex. "PANEL-XXX", "MAIN SWITCHBOARD-XXX", "TRANSFORMER-XXX", "SIGNAL-XXX", "TV-XXX", "EF-1", "AC-1", etc.

**3.7 RUST INHIBITOR**

- A. Channels, joiners, hangers, straps, clamps, brackets, caps, nuts and bolts and associated parts shall be plated electrolytically with zinc followed immediately thereafter by treating freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of one hundred twenty (120) hours when subjected to a standard salt spray cabinet test, or shall be hot dipped galvanized.

**3.8 EQUIPMENT PADS**

- A. Concrete reinforced pads for mounting of equipment (i.e. switchboard, transformers, freestanding panels, etc.) shall be minimum 3000psi, 6" thick with #4 rebars at 12" on center each way. Rebars shall be centered in pad. Pad shall extend 2" beyond equipment and 1.5" above surrounding area. Backfill and compact to 95% maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.

### **3.9 EQUIPMENT ANCHORAGE**

- A. Seismic Anchorage of Electrical equipment shall conform to the regulations of CBC-2019 and ASCE 7-16, Chapters 13 and 29. All equipment shall be braced or anchored to resist a horizontal force acting in any direction using the following criteria:
  - 1. The total design lateral seismic force shall be determined from section 1613A California Building Code (CBC) 2019 and 13.3 ASCE 7-16. Forces shall be applied in the horizontal directions, which results in the most critical loadings for design.
  - 2. The value of  $A_p$  (component amplification factor) and  $R_p$  (component response modification factor) of section 13.3.1 ASCE 7-16 shall be selected from section 13.6-1 ASCE 7-16. The value of  $I_p$  (seismic importance factor) shall be selected from 13.1.3 ASCE 7-16.
- B. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the structural engineer and the District Engineer of the Division of The State Architect.

### **3.10 ARC FLASH**

- A. Electrical equipment such as switchboards, panelboards, load centers, motor control centers, industrial control panels, meter centers shall be field marked to warn persons of potential electric arc flash hazards per CEC 110.16 and NFPA 70E Standard for Electrical Safety in the Workplace. Minimum label wording shall be as follows:

DANGER

Arc Flash and Shock Hazard.

Appropriate PPE Required.

Do not operate controls or open doors without appropriate personal protection equipment.

Failure to comply may result in injury or death.

### **3.11 TEST**

- A. Test all wiring and connections for continuity and grounds; where such test indicate faulty insulation or other defects, locate, repair and retest. Balance loads at panelboards. Furnish all testing equipment.

### **3.12 CLOSING OF AN UNINSPECTED WORK**

- A. Do not allow or cause any of work installed hereunder to be covered up or enclosed before it has been inspected and approved.
- B. Should any work be enclosed or covered up before it has been approved, uncover such work and after it has been inspected and approved, make all repairs necessary to

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restore work of others to conditions in which it was found at time of cutting, all without additional cost to Owner.

**3.13 WARRANTY**

- A. All materials and installation shall be provided with a one (1) year warranty which shall include replacement parts, labor, retesting, and travel to and from the job site. The warranty period shall begin after final acceptance of the project. The warranty shall cover but is not limited to the following:
  - 1. Defective workmanship and installation.
  - 2. All System components, devices, conduit, wires, etc.
  - 3. Manufactured items such as light fixtures, receptacles, switchboard, panelboard, transformer, switches, etc.
  - 4. Basic materials such as conduit, wires, boxes, cabinets, etc.
- B. Certain manufactured items will have longer warranty periods. Refer to specific item and specification section for warranty information and terms.

**END OF SECTION**

**PART 1 - GENERAL****1.1 SCOPE**

- A. The work of this Section consists of basic materials and methods for all work included under Divisions 26, 27, and 28. Additional specifications requirements for electrical work are specified under other sections of Divisions 26, 27 and 28 and where those requirements differ from the requirements of this Section, they shall govern.

**1.2 SUBMITTALS**

- A. Submit product data per Section 26 0000.

**PART 2 - PRODUCTS****2.1 CONDUIT**

- A. Rigid Steel Conduit: Standard weight, mild steel pipe, zinc coated on both inside and outside by a hot dipping or sherardizing process. Inside and outside of conduit shall be finished with a protective coating. All threads galvanized after cutting. Meets UL 6, UL Card #DYIX, and ANSI C80.1.
- B. Intermediate Metallic Conduit (IMC): Intermediate weight, mild steel pipe, meeting same requirements for finish and material as rigid steel conduit. Meets UL 1242, UL Card #DYIX, and ANSI C80.6.
- C. Electrical Metallic Tubing (EMT): Cold rolled steel tubing, hot-dipped galvanized, with zinc coating on outside and protective lubricating coating on inside. Fittings shall meet same requirements for finish and material as EMT. Meets UL 797 and ANSI C80.3.
- D. Flexible Conduit: UL Listed. Flexible steel, zinc coated on both inside and outside by hot dipping or sherardizing process. Liquid-tight conduit shall be galvanized with extruded polyvinyl covering and with watertight connectors, sunlight resistant, direct burial rated. Flexible steel conduit less than 1/2" shall not be used except that 3/8" shall be permitted in lengths not in excess of 6 feet as part of a listed assembly or for tap connections to lighting fixtures as required in CEC Section 410-67(c). Flexible conduit to be one continuous length, no couplings. AFC Liquid-Tuff Type-LFMC and AFC Reduced Wall Flexible Steel Conduit, or equal.
- E. Raceway Fittings:
  - 1. Rigid Steel Conduit: Fittings, such as couplings, connectors, condulets, elbows, bends, etc., shall be subject to same requirements as for rigid steel conduit. Couplings and unions shall be threaded type, assembled with anti-corrosion, conductive anti-seize compound at joints made absolutely tight to exclude water. Connectors shall be threaded hubs with bonding insulated metallic bushings. Unions shall be equal to Crouse Hinds UNY or UNF.
  - 2. IMC: Fittings shall be as specified for rigid steel conduit.
  - 3. EMT: Fittings shall be steel, box connectors shall have insulated throat. Connectors and couplings to be compression type.



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4. Flexible Metallic Conduit: Connectors to be insulated. Metallic connectors (except for liquid-tight) shall be steel "squeeze" type via a screw, Steel City XC-90X and XC-49X series. Liquid-tight metallic connectors shall be watertight approved for such use.
  5. Bushings: Metallic insulated type. Weatherproof or dust-tight installations; liquid-tight with sealing ring and insulated throat, OZ/Gedney type "KR".
  6. Expansion and Deflection Fittings: OZ/Gedney, Type "DX" or accepted equal.
  7. All box connectors to be insulated throat type.
  8. Conduit Straps: Galvanized steel, 2-hole straps. 1-hole straps may be used for conduit sizes 1" and smaller concealed in wall or above ceiling.
- F. Metallic conduits, raceways, and fittings shall be listed and approved as a grounding means.

## **2.2 BOXES**

- A. Galvanized one-piece or welded pressed steel type. Boxes for fixture shall not be less than 4" square and shall be equipped with fixture stud. Boxes shall be at least 1-1/2" deep, 4" square for 1 or 2 gang devices, with plaster rings and gang box with gang cover. Boxes mounted in wall or ceiling finished with gypsum board shall be furnished with 3/4" deep plaster rings. Use screws and not nails to support/secure outlet boxes. Provide blank cover plates for all boxes without devices.
1. 1-gang and 2-gang outlet and junction boxes installed exposed outdoors shall be weatherproof type FS, FD, WS, WD die cast metal or aluminum boxes, Appleton or equal. Plug all unused hubs.
  2. Provide an equipment grounding pigtail at all receptacle, switch, and device outlet boxes. Ground conductor size to match circuit overcurrent protection complying with CEC.
  3. Outlet boxes for data, telecommunications, video, and TV outlets shall be 4 11/16" square x 2.125" deep.
  4. Outlet boxes containing #8, #6, or #4 AWG wires shall be a minimum 2.125" deep per CEC.
- B. Junction boxes located outdoors, or in wet or damp locations shall be rated NEMA-3R, with hinged door and pad-locking tabs.
- C. Equipment furnished by other trade but require electrical connection shall be provided with appropriate backbox.

## **2.3 WIRES**

- A. Wire shall be copper only, manufactured by General Cable Co., Rome, General Electric Co., or Anaconda. Wire shall be rated 90 degrees C for both dry and wet locations, THWN-2, XHHW-2, or RHW-2 insulation. 90 degrees C THHN may be used in dry and damp locations. Wire installed in high temperature areas, including branch circuits in or above roof insulation or in fluorescent ballast channel, shall have type RHW-2 or XHHW-2 90° insulation.

1. Feeders sized #2 and larger routed below grade, extending beyond or outside the building foundation line shall use types XHHW-2, THW-2, or RHW-2 insulation, 90 degrees C dry and wet rated.
- B. Wire shall be Code type copper wire of not less than 98% conductivity. Wires #8 gauge and larger, shall be stranded. Wires shall bear the Underwriters' label, be color coded and be marked with gauge, type and manufacturer's name on 24" centers. Wires smaller than #8 may be solid or stranded. Where stranded wire is used, provide solid pigtail for connection to screw terminals of receptacles, switches, etc.
- C. Color Coding to be as follows:

	208/120 Volts	480/277 Volts
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Grey
Ground	Green	Green

1. Switch legs shall use the same branch circuit phase color coding which they are connected to. IG ground wire shall be green with yellow tracer.
- D. Bring wire to job in original unbroken packages. Obtain approval of inspector or Engineer before installation of wires.

## 2.4 CONVENIENCE OUTLETS

- A. Shall be "Specification" grade rated 15 amperes at 125 volts, duplex, composition base with slots to accommodate parallel plug caps with grounding peg. Contact shall grip both sides of plug prongs. Where only one receptacle is connected to a 20 ampere circuit, a 20 ampere receptacle shall be used. Outlet shall be UL listed. Receptacles to be Hubbell or equal.
  1. 15 Amp: Hubbell 5262 series Heavy Duty Industrial Grade, 8200 series for Hospital Grade.
  2. 20 Amp: Hubbell 5362 series Heavy Duty Industrial Grade, 8300 series for Hospital Grade.
  3. Other designations as noted below:
    - a. Ground Fault: GFR
    - b. Tamper Resistant: TR
    - c. Weather Resistant: WR
    - d. Isolated Ground: IG
  4. Leviton 5252, 5352, 8200, and 8300 series can be considered equal.
  5. Pass & Seymour 5252, 5352, 8200, 8300 series can be considered equal.

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- B. Provide devices with matching plates. Isolated ground (IG) receptacles shall be orange with matching color plate. Hospital grade receptacles shall have a distinctive "green" dot. GFI receptacles shall have a visible (light) indicator.
- C. All 15 and 20 Amp, 125V and 250V non-locking receptacles (NEMA 5-15, 5-20, 6-15, 6-20) located outdoors and/or in damp or wet locations shall be listed weather-resistant type. Weather resistant receptacles shall be the same grade or class as 15A and 20A receptacles specified above.
- D. Weatherproof covers for receptacles in wet locations shall be rated as weatherproof whether or not a plug is inserted (NEMA-3R), minimum 3.25" clearance from front of receptacle, metallic cast type with hinged lid and padlocking hasp, Leviton or equal. Weatherproof covers for receptacles in damp locations shall be rated as weatherproof when attachment plug is removed, with metallic cast cover and flip lids with padlocking hasp.
- E. Provide a separate GFI duplex receptacle at each location identified on the drawings and as specified. Through wiring is not acceptable. Receptacles located at the following locations shall be GFI type, whether indicated in the plans or not.
  - 1. In elevator control rooms.
  - 2. In elevator pits/shafts.
  - 3. In bathrooms or restrooms.
  - 4. Outdoors, on the exterior of the building, and on/above the roof.
  - 5. In commercial and institutional kitchens, unless dedicated to specific equipment.
  - 6. Within 72" from any sink or basin such as in a small kitchen, lunch/break room, and the like.
- F. Provide an equipment grounding jumper (pigtail) connecting the grounding terminal of the receptacle to the grounded box.

## **2.5 SAFETY/DISCONNECT SWITCHES**

- A. Type "HD" Heavy Duty safety switches with externally operated handle. Switches shall be manufactured by Westinghouse, General Electric, Square D, or approved equal. Switches shall be rated 250 and 600 volts, A.C., of size and poles as shown on Drawings and as required. Disconnects used outdoor shall be in NEMA-3R. Provide fused switches with proper sized fuses where required by equipment manufacturer. All switches shall have pad-locking cover with interlocking cover. Switches shall be capable of be pad-lockable in the ON or OFF position. Label switch with circuit identification per section 26 0000, example "AC-1, HD1-24".

## **2.6 INDIVIDUAL CIRCUIT BREAKERS**

- A. Circuit breakers shall be molded case thermal magnetic type with trip rating as scheduled on drawings.
  - 1. Circuit breaker trip settings 300 amps and higher shall have Long-Time setting, STPU, STD, GFPU, Inst. PU settings. Breaker shall be solid state with field adjustable and replaceable trip rating plugs, or of the electronic type.

2. Circuit breakers with trip settings 1200 amps and higher shall be solid state electronic type with full function trip units including: LTPU, LTD, STPU, STD, Inst PU, Inst OFF, GFPU, GFD.
- B. Circuit breakers shall be quick-make, quick-break, trip free operation. The trip-free mechanism shall be independent of manual handle control. All circuit breakers shall be fully rated to withstand the available short circuit current as designated on the drawings. Series rated equipment will not be acceptable.
- C. Breakers to be in NEMA-1 (indoor) or NEMA-3R (damp, wet, and outdoor) enclosures. NEMA-3R enclosures shall have the handle concealed behind the cover, and the hinged cover shall be provided with padlocking tabs. Each circuit breaker shall be identified with an engraved, laminated phenolic plate showing the load served or the function of the circuit breaker and trip rating. The nameplate shall be attached with oval head machine screws tapped into the front of the board. Equip breaker handles with padlocking "lock-off" devices.

## **2.7 PULL LINE**

- A. Furnish and install pull line in all unused (empty) raceways. Pull lines shall not rot or mildew.
  1. Conduits up to 1.5": 1/8" diameter braided line of polypropylene with 200 lbs. tensile strength, IDEAL, Jet-Line #232, or equal.
  2. Conduits 2" or Larger: 3/16" polypropylene pull rope with 800 lbs. tensile strength, IDEAL Pro-Pull or equal.
- B. Provide pull line in conduits for utility company systems, size and type per their requirements.

## **2.8 ACCESS DOORS**

- A. Milcor, Newman or equal with concealed hinges, screwdriver locks, prime coated with rust inhibitive paint, and style of door to suit ceiling or wall construction, including fire rating. Access doors in acoustical tile ceilings shall be Hi-Hatch with tile recess. Doors shall be 14 gage C.R. steel and shall be 22" x 30"; 24" x 24" in tile ceilings, unless otherwise noted or required.

## **2.9 SURFACE METALLIC AND NONMETALLIC RACEWAYS**

- A. The surface raceway system for branch circuit wiring and/or data network, voice, video and other low-voltage wiring shall be manufactured by the Wiremold Company, or equal. Raceway series as indicated on the plans. The raceway and all system components must be UL listed and exhibit non-flammable self-extinguishing characteristics. The raceway shall be a two-piece design with a base and a snap-on cover.
  1. The nonmetallic raceway base and cover shall be manufactured of rigid PVC compound, available in ivory color. Exposed cuts shall be covered with cover clips.
  2. The metal raceway base and cover shall be manufactured of galvanized steel, ivory finish and suitable for field painting.

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- B. A full complement of fittings must be available including, but not limited to flat, internal and external elbows, tees, entrance fittings, boxes, covers, adapters, cover clips, and end caps. The fittings shall match the base and cover, and be of matching colors. All fittings shall be supplied with a base where applicable to eliminate mitering. A transition fitting shall be available to adapt to other Wiremold series raceways. Field cuts shall be clean, straight, and true with no rough edges.
- C. For multicompartment raceways, device brackets shall be available for mounting standard devices in-line or offset from the raceway. A device bracket shall be available for mounting up to four devices at one location. Faceplates shall match and fit flush in the device plate and shall overlay the cover and base to hide uneven cuts. They shall match the raceway base and cover. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP (i.e. data jacks), STP (150 ohm), Fiber Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting.
- D. Work shall include furnishing all raceway and appropriate fittings and device plates to install a nonmetallic surface raceway system. Installer shall comply with detailed manufacturer's instruction sheets, which accompany system components as well as system instruction sheets.
- E. Non-metallic raceway systems shall not be used in Assembly areas and other areas where the system is not rated for the installation. Assembly areas include but not limited to; gymnasiums, multipurpose rooms, auditoriums, conference rooms, etc.

#### **2.10 COVER PLATES**

- A. Switch and receptacle cover plates shall be smooth nylon type. Cover plates for other devices/outlets such as data, telephone, television, etc. shall be nylon. Cover plate color shall be ivory, matching all systems.
- B. For multi-purpose rooms, gymnasiums, kitchens, locker rooms, toilet/restrooms, and walls such as CMU, brick, concrete block, and concrete walls, device plates shall be smooth stainless steel with beveled edges.
- C. Each receptacle shall have its circuit identification on the cover plate (i.e., "LA1-12"). Use typewritten "clear tape". Use black letters/numbers for light colored (white, almond, tan, beige, etc.) cover plates. For darker colored cover plates (black, brown, gray, red, etc.), tape to be white with black letters/numbers. Tape shall be located at the lower portion of the cover plate. Clean surface before adhesive tape is applied, and wrap tape (approx. 1") at each end around back side of each cover plate.
  - 1. For floor boxes, plates shall be engraved with circuit identification.
  - 2. For light switches, use same circuit identification method as for receptacles.

## **PART 3 - EXECUTION**

### **3.1 CONDUITS & CIRCUITS**

- A. All conduits shall be rigid steel or IMC except EMT may be used at following locations:
  - 1. In dry locations in concealed furred spaces.

2. In partitions other than concrete, concrete block, or solid masonry.
  3. For exposed work indoors and outdoors above 10 ft except:
    - a. In special locations prohibited by Code, such as hazardous locations, rigid steel shall be used.
    - b. Conduits exposed on/above the roof shall be rigid steel up to 10 ft above roof surface.
    - c. Conduits exposed in Gymnasiums and Multi-Purpose Rooms shall be rigid steel up to 25 ft.
  4. Concealed above suspended ceilings or ceilings directly attached to structure above.
- B. Flexible Conduit: Shall be used to provide flexible connections of short length (3 ft or less) to equipment subject to vibration or movement and to all motors. Up to 6 ft is allowed where additional flexibility is needed. Provide a separate bonding conductor in all flexible connections/conduit. Flexible conduit shall be one continuous length without couplings.
1. Secure flex conduit within 12" of each box, cabinet, conduit body, or other termination, and maximum 4.5 ft on center. Refer to the CEC for other secure lengths where flexibility is required or in other specific instances.
- C. Run conduit concealed in areas having finished ceilings and in walls. Run all cross conduits and vertical risers or drops concealed in wall and/or partitions. Should it be necessary to notch any framing members, make such notching only at locations and in a manner as approved by the Architects. Where concealing conduit is not possible or practical, conduit may be run exposed in areas only where so permitted by the Architect. Install exposed conduit run neatly, parallel to or at right angles to structural members. Maintain a minimum of 6" clearance from steam or hot water pipes.
- D. Support conduit with straps and secure to wood structure by means of bolts or lag screws, to concrete by means of insert or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry by means of toggle bolts. Expanders and shields shall be steel or malleable iron.
- E. Do not install in concrete slabs.
- F. Support individual conduits with 2-hole steel straps. 1-hole steel straps may be used for conduits 1" and smaller concealed in wall or above ceilings.
- G. Galvanized iron hanger rods sizes 1/4" diameter and larger with spring steel fasteners, clips or clamps specifically designed for purpose for conduits up to 1" size may be used.
- H. Individual conduits 3/4" and smaller run above wire suspended ceilings may be supported from independent hanger wires with approved spring steel clips. Wire ties will not be acceptable. Wire shall be taut and secured to ceiling and structure above.
- I. Support multi-parallel horizontal conduit runs with trapeze type hangers consisting of two or more steel hanger rods, cross channels, J-bolts, clamps, etc.
- J. Sizes of rods and cross channels shall be designed to support four times actual load. Hanger rods shall have safety factor of 5 based on ultimate strength of material used.

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- K. Conduits for data, telecommunications, signal, video, TV, and/or containing fiber optic, coaxial, or OSP (outside plant) multi-pair cables shall have a minimum inside bend radius per CEC Table 346-10 (do not use exception); except that conduits 2" to 4" shall be minimum 24" radius bends.
- L. After installation of conductors, all conduits routed below grade shall be sealed at each opening, including risers and in pull boxes, to prevent the entrance of water and debris.
- M. Conduits not terminated into a box or cabinet, such as stubbed to a backboard, shall be terminated with an insulated bushing. Bushings for metallic conduits shall be metallic type secured by set screw, compression, or threaded type. Bushings for PVC conduits shall be glued in place.
- N. Although circuiting is shown as diagrammatic, their point-to-point destinations and their indication of above/below ground route shall be followed as much as possible. Where site conditions dictate that an alternate means of routing will alleviate conflicts, the alternate means will be considered with prior approval by the Engineer.
- O. Where cinder fill is encountered in Block walls, conduit shall be PVC-40 where in contact with cinder fill. Boxes shall be PVC type where in contact with cinder fill.
- P. EMT conduit circuits installed on the roof, if allowed by the Engineer, shall have a ground conductor routed with the circuit conductors sized per the circuit protective device.
- Q. Horizontal runs of conduit above suspended wire lay-in ceilings shall not be less than 12" above the ceiling.
- R. Maintain 12 inch separation between power circuits (>120V) and all signal circuits (data, telephone, speaker, clock, etc.) to prevent interference.
- S. Feeder conduits connected to panels/switchboard shall have ground lug bushing connected to equipment ground buss with ground wire same size as largest ground wire in the panel/switchboard.
- T. Conduits penetrating through the roof shall be secured within 12" below roof and supported within 12" of the penetration on the roof.
- U. Where conduits cross building expansion/seismic joints provide a short length of flexible conduit (do not exceed 6 ft.) and fittings listed as a grounding means, or in locations where flex conduit cannot be used provide UL listed expansion/seismic fittings.
- V. Conduits concealed in any masonry shall be routed in a conduit sleeve. Such sleeves shall not be placed closer than 3 diameters, center to center.
- W. Conduits to air conditioning (AC) equipment, fans, or other roof mounted equipment shall rise up from the ceiling below through the equipment curb or conduit window within the equipment, if allowed by equipment manufacturer, to prevent additional roof penetrations.

- X. Where conduit passes through finished walls or ceilings, provide steel escutcheon plates, chrome or painted as directed. Conduit which penetrate floor slabs, concrete or masonry walls shall be grouted and sealed watertight at penetrations.
- Y. For 20-amp 120 or 277 Volt Circuits using 90-deg C Wires:
  - 1. Do not install more than three(3) circuits in any conduit.
  - 2. Do not install more than six(6) current carrying conductors in any conduit.
  - 3. Where using #10 AWG wires to allow for conductor derating:
    - a. Do not install more than six(6) circuits in any conduit.
    - b. Do not install more than twelve(12) current carrying conductors in any conduit.
- Z. Cables and Raceways installed under metal-corrugated sheet roof decking shall maintain a minimum 1.5" from the nearest surface of the roof decking per CEC. This shall not apply to RMC or IMC.
- AA. Where switches control lighting loads supplied by a grounded branch circuit, the grounded conductor for the controlled lighting circuit shall be provided at the switch location. The grounded circuit conductor can be omitted where exceptions 1 & 2 apply. (CEC 404.2(C))

### **3.2 CAPPING**

- A. Cap conduits during construction with manufactured seals. Swab out conduits before wires are pulled in.
- B. Cap all empty conduits below grade and in pull boxes with manufacturer's caps to prevent entrance of water and debris, attach pull string to cap.

### **3.3 FLASHING**

- A. Make conduit projecting through roof watertight by proper flashing. Secure a sheet lead cap with a tightening bend to conduit. Use two collars for tar or asphalt composition roofings. Set one collar directly on roof deck and second collar set over on top of roofing felts. Lead sheet flashing shall be made of 4 lb. sheet lead. Use Stoneman #1100-4 series for individual conduits and #910/915 multi-flash for more than on conduit penetration, or equal.

### **3.4 PENETRATIONS OF FIRE RESISTIVE WALLS AND PARTITIONS**

- A. Penetrations of protected openings (fire rated walls, ceilings, floor-ceilings, roofs, etc.) shall be protected in accordance with the California Building Code, Part 2, Chapter 7, Title 24. Penetrations shall apply to conduits (raceways), cable trays, boxes, cabinets, panels, cables, etc.
- B. Fire stopping shall be provided at penetrations of fire resistive walls, floors, ceilings, floor-ceiling assemblies, and roofs. Fire-stopping shall have a "F" and/or "T" rating as determined by tests conducted in accordance with ASTM E 814 or UL-1479. Fire stopping system/materials shall be UL Listed.



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#### **3.5 ACCESS DOORS**

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of electrical systems; for example, inaccessible areas and attics containing heat detectors, junction boxes, etc. Access doors shall provide for complete removal and replacement of equipment. Provide fire rated access doors where located in fire rated partitions.

#### **3.6 BOXES**

- A. Nails shall not be used to support outlet boxes. Boxes must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy-duty box hangers. For metal stud construction, use metal box hangers only. Box hangers shall be securely tied or welded (where permitted) or screwed to metal studs. Paint weld with rust inhibitor. Boxes installed in masonry tile or concrete block construction shall be secured with auxiliary plates, bars or clips and be grouted in place.
  - 1. Outlet Boxes with Receptacles or Switches: Provide a solid pigtail (green) ground wire grounded to the metallic outlet box. Pigtail shall also ground device and separate ground conductor if available. Size of ground wire to match overcurrent protection.
- B. Locate outlets at the following heights above floor to the center of the device or handle unless otherwise noted on Drawings or in Specifications.
  - 1. The top of the outlet box shall not be higher than 48" above finished floor, and the bottom of the outlet box shall not be less than 15" above finished floor. For forward or side approach over counter, maximum 44" and 46" respectively to top of box.
  - 2. Convenience Outlets: 18" (4" above counter or splash).
  - 3. Local Switches: 45".
  - 4. Telephone Outlets: 18" (45" for wall phone).
  - 5. Data, TV Outlets: 18".
  - 6. Where devices are shown at counter locations, they shall be located approximately 4" above counter, clearing back-splash where applicable.
  - 7. Refer to elevations and details on Architectural Drawings for exact heights and locations of all electrical outlets for switches, receptacles, special equipment, etc. Where above heights do not suit building construction or finish, consult Architect.
- C. Install pull boxes or junction boxes as required in accessible spaces but do not install in finished areas unless approved by Architect.
- D. Where fire rated construction is required (refer to Architectural Drawings), do not locate electrical outlet boxes back-to-back. Provide a minimum of 24" horizontal separation between outlet boxes on opposite side of the same wall. Where such restrictions cannot be met, provide fire-stopping around box such as 3M Moldable Putty Pads or equal.

- E. Boxes up to 100 cubic inches located in suspended wire ceilings may be supported through an independent hanger wire with approved tension clips. Wire shall be taut. Secure wire to the structure above and the ceiling below.

### **3.7 CONDUCTORS**

- A. Splices and joints for #10 AWG or smaller wiring shall be twisted together electrically and mechanically strong and insulated with approved type insulated electrical spring connectors, Scotchlok or Ideal. Joints and connections for #8 AWG or larger shall be made with Burndy, T & B, or approved equal, solderless tool applied pressure lugs and connectors. Uninsulated lugs and wire ends shall be insulated with layers of plastic tape equal to insulation of wire and with all irregular surfaces properly padded with "Scotchfil" putty prior to application of tape. Tape shall be equal to Scotch #33, General Electric #AW-1, or approved equal. Feeder splicing is not permitted.
  - 1. In special instances where feeder splicing is allowed by the Engineer, it shall be made with high compression sleeve type connector followed by manufactured splicing kit utilizing as insulators, resins poured into a ready-to-use plastic mold to provide a uniform, moisture-proof tough, impact-resistant insulation.
  - 2. Conductor splices below grade shall meet ANSI C119.1-1986 and UL 486D Standards. Raychem WCSM or FCSM heavy wall heat shrink tubing; or RVS or RVC series if use of flame heat is prohibited. Conductors to be joined with compression sleeve connectors.
- B. Use only UL approved wire pulling compound as lubricant.
- C. Lace conductors together with waxed linen lacing cord, T & B "Ty-Rap", Holub "Quik-Wrap" or equal, in a neat and workmanlike manner in panelboards, wireways, raceways, pull boxes and similar locations.
- D. #12 AWG wire shall be minimum size wire used for lighting and power circuits. Motor control circuits may be #14 except as marked on Drawings, unless shown.
- E. Provide cable supports in risers by means of a clamping device with insulated wedges or "Kellem" grips.
- F. All conductors shall be in conduit unless otherwise indicated.
- G. Conduit sizes shall be based on code fill table for THW insulated wires to accommodate the number, size, and type of wires shown or specified.
- H. Wiring installed in pull boxes or junction boxes, where wire is pulled through without terminations (except splices), shall have a service loop around the interior of the box for 360 degrees utilizing the largest circumference.
- I. Use #10 AWG conductor for 20 Amp 120 Volt circuit home runs longer than 75 feet, and for 20 Amp 277 Volt circuit homeruns longer than 200 feet.
- J. Where conductors are increased in size and number (such as for voltage drop reasons), such that conductors will not fit the standard breaker or panel lugs, terminate conductors in one of the following means:
  - 1. Provide larger breaker frame or panelboard.

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2. Provide oversized lugs.
3. Last Option only with Approval from Engineer: Terminate wires in multiport connector and provide pigtail. Splice to be made in panel or switchboard if space is available, or in separate splice box. This option will not be normally granted.

### **3.8 PANELS AND CABINETS**

- A. Recessed enclosures (panelboards, terminal cabinets, cabinets, control cabinets, etc.) shall be provided with a minimum of three 3/4" empty conduits stubbed into accessible space above the ceiling. Drawings may require additional conduits.

### **3.9 GROUNDING**

- A. Grounding and ground bonding of the electrical installation shall be in accordance with CEC Article 250, and any applicable codes. Ground fittings shall be approved manufactured type, installed and connected to conform with Code requirements.
- B. Neutral conductors and noncurrent-carrying parts of equipment at each installation shall be grounded in accordance with applicable code. Ground conductor shall be copper having a current capacity sized in accordance with CEC.
- C. All equipment cases, motor frames, etc., shall be completely grounded to satisfy requirements of CEC. Install bond wire in flexible conduit. Install copper bond wire, sized in accordance with CEC, in all nonmetallic raceways and bond to all metallic parts using approved fittings.
- D. Service ground conductor shall be connected to a "Ufer" encased ground and bonded to the metallic cold water pipe system and to the metallic natural gas line.
- E. Interior metallic cold water pipe system and other interior metallic piping systems shall be ground bonded to the building grounding system.
- F. Each building shall be provided with a grounding electrode connected to the metallic enclosure of the building disconnecting means. Grounding electrode conductor shall be sized per CEC table 250-66.
- G. Total ground resistance shall not exceed 25 ohms.
- H. All connections shall be made with solderless connectors or molded fusion-welding process.
- I. Equipment grounding conductors shall be insulated with a continuous green outer finish along its entire length. Conductors size #4 AWG and larger may be identified (with green electrical tape applied half-lapped) at each end and at every point where the conductor is accessible. Tape shall be applied from its point of entry to point of exit or termination.
- J. Insulated grounded (neutral) conductors shall be identified with a continuous white outer finish along its entire length. Neutral conductors #4 AWG or larger can be identified by a distinctive white marking (applied half-lapped with white electrical tape) for the last 12 inches at each end.

**3.10 FIELD TESTS**

- A. General: Perform field test in the presence of the Owner's Representative except as otherwise specified. Provide required labor, materials, equipment and connections to perform tests. Document results and submit them to the Owner's Representative. Repair or replace all defective work.

**3.11 GROUND FAULT PROTECTION AND TESTING**

- A. Where indicated on the plans, provide circuit breaker with ground fault protection. The ground fault system shall include a memory circuit for positive tripping action despite intermittent arcing ground faults.
- B. Provide an integral means of testing the ground fault system to meet the on-site requirements of CEC Articles 230 and 517.
- C. Provide acceptance testing per InterNational Electrical Testing Association Inc. (NETA) specifications and standards. Submit test results.

**3.12 CLEANING**

- A. Brush and clean work prior to concealing, painting and acceptance. Performed in stages if directed.
- B. Clean and repair soiled or damaged painted exposed work and match adjoining work before final acceptance.
- C. Remove debris from inside and outside of material, equipment and structures.

**3.13 WARRANTY**

- A. All materials and installation shall be provided with a one (1) year warranty which shall include replacement parts, labor, retesting, and travel to and from the job site. The warranty period shall begin after final acceptance of the project.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. Section includes electrical connections to equipment.
- B. Related Sections:
  - 1. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cable.
  - 2. Section 26 0533 - Raceway and Boxes for Electrical Systems.

### **1.2 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA WD 1 - General Requirements for Wiring Devices.
  - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

### **1.3 SUBMITTALS**

- A. Section 01 3300 - Submittal Procedures.
- B. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's installation instructions.

### **1.4 CLOSEOUT SUBMITTALS**

- A. 017700 - Closeout Procedures.

### **1.5 COORDINATION**

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

## **PART 2 - PRODUCTS**

### **2.1 CORD AND PLUGS**

- A. Manufacturers:
  - 1. Leviton.
  - 2. Arrow Hart.

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- 3. Pass & Seymour.
- 4. Eagle.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet furnished for equipment.
- D. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify equipment is ready for electrical connection, for wiring, and to be energized.

### **3.2 EXISTING WORK**

- A. Remove exposed abandoned equipment wiring connections, including abandoned connections above accessible ceiling finishes.
- B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.
- C. Extend existing equipment connections using materials and methods compatible with existing electrical installations.

### **3.3 INSTALLATION**

- A. Make electrical connections.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install receptacle outlet to accommodate connection with attachment plug.
- E. Install cord and cap for field-supplied attachment plug.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.

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- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**3.4 ADJUSTING**

- A. Section 01 7300 and 01 7700 - Execution and Closeout Procedures.
- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 DESCRIPTION**

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

### **1.2 MINIMUM REQUIREMENTS**

- A. The latest California Building Code (CBC), Underwriters Laboratories, Inc. (UL), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

### **1.3 TEST STANDARDS**

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
  - 1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing



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states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.

2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified: Materials and equipment which:
  - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
  - b. Are periodically inspected by a NRTL.
  - c. Bear a label, tag, or other record of certification.
4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

**1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)**

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
  1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
  2. The District reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

**1.5 APPLICABLE PUBLICATIONS**

- A. Applicable publications listed in all Sections of Division 26 shall be the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

**1.6 MANUFACTURED PRODUCTS**

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.

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- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
  - 1. Components of an assembled unit need not be products of the same manufacturer.
  - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  - 3. Components shall be compatible with each other and with the total assembly for the intended service.
  - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer. In addition, the following requirements shall be complied with:
  - 1. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to EOR fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
  - 2. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer. The Contractor shall be liable for all additional expenses for the EOR to witness factory re-testing.

**1.7 MATERIALS AND EQUIPMENT PROTECTION**

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
  - 1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
  - 2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
  - 3. Damaged equipment shall be repaired or replaced, as determined by the IOR.
  - 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
  - 5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

**1.8 WORK PERFORMANCE**

- A. All electrical work shall comply with requirements of the latest NFPA 70 (NEC and CEC), NFPA 70B, NFPA 70E, NFPA 99, NFPA 110, OSHA Part 1910 subpart J – General Environmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.

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- B. Job site safety and worker safety is the responsibility of the Contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. However, energized electrical work may be performed only for the non-destructive and non-invasive diagnostic testing(s), or when scheduled outage poses an imminent hazard to patient care, safety, or physical security. In such case, all aspects of energized electrical work, such as the availability of appropriate/correct personal protective equipment (PPE) and the use of PPE, shall comply with the latest NFPA 70E, as well as the following requirements:
  - 1. Only Qualified Person(s) shall perform energized electrical work. Supervisor of Qualified Person(s) shall witness the work of its entirety to ensure compliance with safety requirements and approved work plan.
  - 2. At least two weeks before initiating any energized electrical work, the Contractor and the Qualified Person(s) who is designated to perform the work shall visually inspect, verify and confirm that the work area and electrical equipment can safely accommodate the work involved.
  - 3. At least two weeks before initiating any energized electrical work, the Contractor shall develop and submit a job specific work plan, and energized electrical work request to EOR and IOR. At the minimum, the work plan must include relevant information such as proposed work schedule, area of work, description of work, name(s) of Supervisor and Qualified Person(s) performing the work, equipment to be used, procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
  - 4. Energized electrical work shall begin only after the Contractor has obtained written approval of the work plan, and the energized electrical work request from IOR and utility inspector. The Contractor shall make these approved documents present and available at the time and place of energized electrical work.
  - 5. Energized electrical work shall begin only after the Contractor has invited and received acknowledgment from IOR and utility inspector to witness the work.
- D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article WORK SEQUENCE under Section 01 1100, SUMMARY OF WORK.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 7329, CUTTING AND PATCHING.
- F. Coordinate location of equipment and conduit with other trades to minimize interference.

**1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the CEC.
- C. Inaccessible Equipment:

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1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
  2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

**1.10 EQUIPMENT IDENTIFICATION**

- A. In addition to the requirements of the CEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:
1. Nominal system voltage.
  2. Equipment/bus name, date prepared, and manufacturer name and address.
  3. Arc flash boundary.
  4. Available arc flash incident energy and the corresponding working distance.
  5. Minimum arc rating of clothing.
  6. Site-specific level of PPE.

**1.11 SUBMITTALS**

- A. Submit to EOR in accordance with Section 01 3300, SUBMITTAL PROCEDURES.
- B. The EOR's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.

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- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the EOR to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals per spec section 01 3300.
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
  - 2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
  - 3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
  - 1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
  - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
  - 3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
  - 4. The manuals shall include:

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- a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
  - b. A control sequence describing start-up, operation, and shutdown.
  - c. Description of the function of each principal item of equipment.
  - d. Installation instructions.
  - e. Safety precautions for operation and maintenance.
  - f. Diagrams and illustrations.
  - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
  - h. Performance data.
  - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
  - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.
- H. After approval and prior to installation, furnish the //Resident Engineer// //COR// with one sample of each of the following:
- 1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
  - 2. Each type of conduit coupling, bushing, and termination fitting.
  - 3. Conduit hangers, clamps, and supports.
  - 4. Duct sealing compound.
  - 5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

**1.12 SINGULAR NUMBER**

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

**1.13 ACCEPTANCE CHECKS AND TESTS**

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all

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components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the District.

- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests for the equipment. Repair, replacement, and re-testing shall be accomplished at no additional cost to the District.

**1.14 WARRANTY**

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the District.

**1.15 INSTRUCTION**

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the District at least 30 days prior to the planned training.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 SUMMARY**

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

### **1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Field quality-control test reports.

### **1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### **2.2 CONDUCTORS AND CABLES**

- A. Manufacturers:
  - 1. American Insulated Wire Corp.; a Leviton Company.
  - 2. General Cable Corporation.
  - 3. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THW, THHN-THWN2 or XHHW2 complying with NEMA WC 5 or 7.



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- E. Multiconductor Cable: Metal-clad cable, Type MC with ground wire. MC shall not be used unless approved prior to installation by the school district.

**2.3 CONNECTORS AND SPLICES**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. AMP Incorporated/Tyco International.
  - 3. Hubbell/Anderson.
  - 4. O-Z/Gedney; EGS Electrical Group LLC.
  - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

**PART 3 - EXECUTION**

**3.1 CONDUCTOR AND INSULATION APPLICATIONS**

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN 2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC shall not be used without notice of approval from the school district.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

**3.2 INSTALLATION**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

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- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 0500 "Common Work Results for Electrical."
- F. Identify and color-code conductors and cables according to Section 26 0500 "Common Work Results for Electrical."
- G. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- H. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

**3.3 FIELD QUALITY CONTROL**

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

**1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For ground rods.
  - 1. Field quality-control test reports.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**1.4 GROUNDING ELECTRODE SYSTEM**

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Concrete-encased electrode.
- D. Rod electrode.

**1.5 PERFORAMNCE REQUIREMENTS**

- A. Grounding System Resistance: 5 ohms.

**1.6 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate all resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include all instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

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**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cadweld.
  2. Thermoweld.
  3. Copperweld Corp.
  4. Dossert Corp.
  5. Erico Inc.; Electrical Products Group.
  6. Galvan Industries, Inc.
  7. Harger Lightning Protection, Inc.
  8. Hastings Fiber Glass Products, Inc.
  9. ILSCO.
  10. Kearney/Cooper Power Systems.
  11. Korns, C. C. Co.; Division of Robroy Industries.
  12. Lyncole XIT Grounding.
  13. O-Z/Gedney Co.; a business of the EGS Electrical Group.
  14. Burndy "Hyground" compression system
  15. Thomas & Betts, compression system

**2.2 GROUNDING CONDUCTORS**

- A. For insulated conductors, comply with Section 26 0519 "Low-Voltage Power Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.
- N. Foundation Electrode: 4/0 AWG.

## **2.3 ROD ELECTRODES**

- A. Ground Rods: Copper-clad steel.
  - 1. Size: 3/4 inch diameter by 120 inches.
  - 2. Manufacturer: Blackburn; Eritech; Or equal.

## **2.4 GROUNDING WELL COMPONENTS**

- A. Well Pipe: 12 inch diameter by 24 inches long concrete pipe with belled end.
- B. Well Cover: Cast iron with legend 'GROUND' embossed cover.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
- E. Equipment Grounding Conductors: Comply with CEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by CEC are indicated.
  - 1. Install insulated equipment grounding conductors in feeders.
  - 2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at

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- equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
  4. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
    - a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
    - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
  2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- G. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- H. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- I. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  2. Make connections with clean, bare metal at points of contact.
  3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
  4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
  5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
  6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
  8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
  9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
  10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
  11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- J. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- K. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

### **3.2 FIELD QUALITY CONTROL**

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
  2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

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3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
  - a. Equipment Rated 500 kVA and Less: 10 ohms.
  - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
  - c. Equipment Rated More Than 1000 kVA: 3 ohms.
  - d. Manhole Grounds: 10 ohms.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Steel slotted support systems.
  - 2. Aluminum slotted support systems.
  - 3. Nonmetallic slotted support systems.
  - 4. Conduit and cable support devices.
  - 5. Support for conductors in vertical conduit.
  - 6. Structural steel for fabricated supports and restraints.
  - 7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
  - 8. Fabricated metal equipment support assemblies.
- B. Related Requirements:
  - 1. Section 26 0548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
    - a. Slotted support systems, hardware, and accessories.
    - b. Clamps.
    - c. Hangers.
    - d. Sockets.
    - e. Eye nuts.
    - f. Fasteners.
    - g. Anchors.
    - h. Saddles.
    - i. Brackets.
  - 2. Include rated capacities and furnished specialties and accessories.

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- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
  - 1. Hangers. Include product data for components.
  - 2. Slotted support systems.
  - 3. Equipment supports.
  - 4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for electrical systems.
  - 1. Include design calculations and details of hangers.
  - 2. Include design calculations for seismic restraints.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Ductwork, piping, fittings, and supports.
  - 3. Structural members to which hangers and supports will be attached.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Items penetrating finished ceiling, including the following:
    - a. Luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
    - f. Projectors.
- B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.

## **1.5 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M.
  - 2. AWS D1.2/D1.2M.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
  - 2. Component Importance Factor: 1.5 or 1.0.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame Rating: Class 1.
  - 2. Self-extinguishing according to ASTM D 635.

### **2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. ERICO International Corporation.
    - d. Flex-Strut Inc.
    - e. GS Metals Corp.
    - f. G-Strut.
    - g. Haydon Corporation.
    - h. Metal Ties Innovation.
    - i. Thomas & Betts Corporation; A Member of the ABB Group.
    - j. Unistrut; Part of Atkore International.
    - k. Wesanco, Inc.

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2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Material for Channel, Fittings, and Accessories: Galvanized steel.
  1. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
  2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  5. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Cooper Industries, Inc.
    - b. Flex-Strut Inc.
    - c. Haydon Corporation.
    - d. MKT Metal Manufacturing.
    - e. Thomas & Betts Corporation; A Member of the ABB Group.
    - f. Unistrut; Part of Atkore International.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Material: 6063-T5 aluminum alloy.
  4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
  5. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
  6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
  7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-line, an Eaton business.
    - c. Fabco Plastics Wholesale Limited.
    - d. G-Strut.
    - e. Haydon Corporation.
    - f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
  2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
  3. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches or 13/16 inches.
  4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
  5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
  6. Rated Strength: Selected to suit applicable load criteria.
  7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Hilti, Inc.
      - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      - 3) MKT Fastening, LLC.
      - 4) Simpson Strong-Tie Co., Inc.

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2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - 1) B-line, an Eaton business.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti, Inc.
    - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All Stainless - steel springhead type.
7. Hanger Rods: Threaded steel.

**2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 5000 "Metal Fabrications" for steel shapes and plates.

**PART 3 - EXECUTION**

**3.1 APPLICATION**

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
  1. NECA 1.
  2. NECA 101
  3. NECA 102.
  4. NECA 105.
  5. NECA 111.
- B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

- C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least **25** percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

### **3.2 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.

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- 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

**3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

- A. Comply with installation requirements in Section 05 5000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

**3.4 CONCRETE BASES**

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 3000 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
  - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

**3.5 PAINTING**

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 09 9113 "Exterior Painting"/Section 09 9123 "Interior Painting" and Section 09 9600 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.



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- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

**1.2 SUBMITTALS**

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer's specified.

**2.2 METAL CONDUIT AND TUBING**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflec Inc.
  - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 4. Electri-Flex Co.
  - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
  - 6. LTV Steel Tubular Products Company.
  - 7. Manhattan/CDT/Cole-Flex.
  - 8. O-Z Gedney; Unit of General Signal.
  - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.

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- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. EMT and Fittings: ANSI C80.3.
  - 1. Fittings: Compression type.
- F. FMC: Aluminum.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

**2.3 NONMETALLIC CONDUIT AND TUBING**

- A. Manufacturers:
  - 1. American International.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. Arnco Corp.
  - 4. Cantex Inc.
  - 5. Certainteed Corp.; Pipe & Plastics Group.
  - 6. Condux International.
  - 7. ElecSYS, Inc.
  - 8. Electri-Flex Co.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Manhattan/CDT/Cole-Flex.
  - 11. RACO; Division of Hubbell, Inc.
  - 12. Spiralduct, Inc./AFC Cable Systems, Inc.
  - 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

**2.4 SURFACE RACEWAYS**

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
  - 1. Manufacturers:
    - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
    - b. Thomas & Betts Corporation.
    - c. Walker Systems, Inc.; Wiremold Company (The).
    - d. Wiremold Company (The); Electrical Sales Division.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

## **2.5 BOXES, ENCLOSURES, AND CABINETS**

### **A. Manufacturers:**

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.

### **B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.**

### **C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.**

### **D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.**

### **E. Floor Boxes: Cast metal, fully adjustable, rectangular.**

### **F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.**

### **G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.**

### **H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.**

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

### **I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.**

## **2.6 FACTORY FINISHES**

### **A. Finish: For raceway, enclosures, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.**

## **PART 3 - EXECUTION**

### **3.1 RACEWAY APPLICATION**

#### **A. Outdoors:**

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.

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3. Underground, Single Run: RNC.
  4. Underground, Grouped: RNC.
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
1. Exposed: EMT.
  2. Concealed: EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  4. Damp or Wet Locations: Rigid steel conduit.
  5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

**3.2 INSTALLATION**

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Section 26 0500 "Common Work Results For Electrical."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

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1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  2. Space raceways laterally to prevent voids in concrete.
  3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
  2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a

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flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where otherwise required by CEC.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

**3.3 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
  - 2. USB charger devices.
  - 3. GFCI receptacles.
  - 4. Twist-locking receptacles.
  - 5. Pendant cord-connector devices.
  - 6. Cord and plug sets.
  - 7. Toggle switches.
  - 8. Decorator-style convenience.
  - 9. Wall switch sensor light switches with ultrasonic sensors.
  - 10. Digital timer light switches.
  - 11. Wall-box dimmers.
  - 12. Wall plates.
  - 13. Floor service outlets.
  - 14. Poke-through assemblies.
  - 15. Prefabricated multioutlet assemblies.
  - 16. Service poles.

### **1.3 DEFINITIONS**

- A. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.



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- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- H. UTP: Unshielded twisted pair.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

**PART 2 - PRODUCTS**

**2.1 GENERAL WIRING-DEVICE REQUIREMENTS**

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

**2.2 STRAIGHT-BLADE RECEPTACLES**

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  2. Eaton (Arrow Hart).
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Leviton Manufacturing Co., Inc.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
- B. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- C. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

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2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

**2.3 USB CHARGER DEVICES**

- A. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
  3. USB Receptacles: Type A.
  4. Line Voltage Receptacles: two pole, three wire, and self-grounding.
- B. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, UL 1310, and FS W-C-596.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
  3. USB Receptacles: Type A.
  4. Line Voltage Receptacles: two-pole, three wire, and self-grounding.

**2.4 GFCI RECEPTACLES**

- A. General Description:
  1. 125 V, 20 A, straight blade, non-feed-through type.
  2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (Arrow Hart).
  - b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Hubbell Incorporated; Wiring Device-Kellems.
    - b. Pass & Seymour/Legrand (Pass & Seymour).
- D. Hospital-Grade, Duplex GFCI Convenience Receptacles: Comply with UL 498 Supplement sd.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

## **2.5 SPD RECEPTACLES**

- A. General Description: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.
  1. 125 V, 20 A, straight-blade type.
  2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
  3. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

## **2.6 TWIST-LOCKING RECEPTACLES**

- A. Twist-Lock, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).

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- b. Hubbell Incorporated; Wiring Device-Kellems.
  - c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- B. Twist-Lock, Isolated-Ground, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Grounding: Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

**2.7 PENDANT CORD-CONNECTOR DEVICES**

- A. Description:
  - 1. Matching, locking-type plug and receptacle body connector.
  - 2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
  - 3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
  - 4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

**2.8 CORD AND PLUG SETS**

- A. Description:
  - 1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
  - 3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

**2.9 TOGGLE SWITCHES**

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:

1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  2. Two Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  3. Three Way:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
  4. Four Way:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).
- C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).

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- D. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- E. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- G. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
  - d. Pass & Seymour/Legrand (Pass & Seymour).
- H. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- I. Toggle Switches: Square Face, 120/277 V, 15 A; comply with NEMA WD 1, UL 20, and FS W-S-896.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
- J. Lighted Toggle Switches: Square Face, 120 V, 15 A; comply with NEMA WD 1 and UL 20.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.
    - c. Leviton Manufacturing Co., Inc.
    - d. Pass & Seymour/Legrand (Pass & Seymour).
  - 2. Description: With LED-lighted handle, illuminated when switch is off.

## **2.10 WALL SWITCH SENSOR LIGHT SWITCH, ULTRASONIC**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.



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- B. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
  - 1. Connections: Provisions for connection to BAS.
  - 2. Connections: Hard wired.
  - 3. Connections: Wireless.
  - 4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
  - 5. Integral relay for connection to BAS.
  - 6. Adjustable time delay of 20 minutes.
  - 7. Able to be locked to Manual-On mode.
  - 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
  - 9. Comply with NEMA WD 1, UL 20, and FS W-S-896.

**2.11 DIGITAL TIMER LIGHT SWITCH**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton (Arrow Hart).
  - 2. Hubbell Incorporated; Wiring Device-Kellems.
  - 3. Leviton Manufacturing Co., Inc.
- B. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
  - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
  - 2. Integral relay for connection to BAS.

**2.12 WALL-BOX DIMMERS**

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
  - 1. 600 W; dimmers shall require no derating when ganged with other devices.
- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

- E. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

## **2.13 WALL PLATES**

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
  - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
  - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

## **2.14 POKE-THROUGH ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Hubbell Incorporated; Wiring Device-Kellems.
  - 2. Pass & Seymour/Legrand (Pass & Seymour).
  - 3. Square D; by Schneider Electric.
  - 4. Wiremold / Legrand.
- B. Description:
  - 1. Factory-fabricated and -wired assembly of below-floor junction box with multi-channelled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
  - 2. Comply with UL 514 scrub water exclusion requirements.
  - 3. Service-Outlet Assembly: Pedestal type with services indicated complying with requirements in Section 27 1513 "Communications Copper Horizontal Cabling."
  - 4. Size: Selected to fit nominal cored holes in floor and matched to floor thickness.
  - 5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
  - 6. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
  - 7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 27 1513 "Communications Copper Horizontal Cabling."

## **2.15 PREFABRICATED MULTIOUTLET ASSEMBLIES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

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1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold / Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

**2.16 FINISHES**

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPD Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan-speed control are listed for that application.
  3. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

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- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

**3.2 GFCI RECEPTACLES**

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

**3.3 IDENTIFICATION**

- A. Comply with Section 26 0511 "Requirements for Electrical Installations".
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

**3.4 FIELD QUALITY CONTROL**

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
  - 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
  - 2. Test Instruments: Use instruments that comply with UL 1436.
  - 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 3. Using the test plug, verify that the device and its outlet box are securely mounted.
- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Receptacle switches.
  - 4. Shunt trip switches.
  - 5. Molded-case circuit breakers (MCCBs).
  - 6. Molded-case switches.
  - 7. Enclosures.

### **1.3 DEFINITIONS**

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.

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1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Data: Certificates, for enclosed switches and circuit breakers, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

**1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
  1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:
    - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
  2. Fuse Pullers: Two for each size and type.

**1.8 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Accredited by NETA.
  1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

**1.9 FIELD CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

**1.10 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: three year(s) from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

**2.2 GENERAL REQUIREMENTS**

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

**2.3 FUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. ABB Inc.
  - 2. Eaton.
  - 3. General Electric Company.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.



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5. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
1. Single throw.
  2. Three pole.
  3. 600-V ac.
  4. 200 A and smaller.
  5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
  6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac
  6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  8. Service-Rated Switches: Labeled for use as service equipment.

**2.4 NONFUSIBLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Eaton.
  2. General Electric Company.
  3. SIEMENS Industry, Inc.; Energy Management Division.
  4. Square D; by Schneider Electric.
- B. Type GD, General Duty, Three Pole, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

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- C. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Three Pole, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac
  - 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 8. Service-Rated Switches: Labeled for use as service equipment.

**2.5 RECEPTACLE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

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- D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- E. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).
- F. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
  - 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 7. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 8. Service-Rated Switches: Labeled for use as service equipment.

**2.6 SHUNT TRIP SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Bussmann, an Eaton business.
  - 2. Littelfuse, Inc.
  - 3. Mersen USA.
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600-V ac, 30, 60, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

- E. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer or source of enough capacity to operate shunt trip, pilot, indicating and control devices.
- F. Accessories:
  - 1. Oiltight key switch for key-to-test function.
  - 2. Oiltight red ON pilot light.
  - 3. Isolated neutral lug; 100 or 200 percent rating.
  - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  - 5. Form C alarm contacts that change state when switch is tripped.
  - 6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac or 24-V dc coil voltage.
  - 7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
  - 8. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 9. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
  - 10. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
  - 11. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24-V ac.
  - 12. Hookstick Handle: Allows use of a hookstick to operate the handle.
  - 13. Lugs: Mechanical/Compression type, suitable for number, size, and conductor material.
  - 14. Service-Rated Switches: Labeled for use as service equipment.

## **2.7 MOLDED-CASE CIRCUIT BREAKERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. NOARK Electric North America.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.
  - 5. Square D; by Schneider Electric.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker

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handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.

- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. \_\_\_\_\_ Amps Available. Identical Replacement Component Required."
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 167 deg F rated wire, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
- G. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
  - 1. Instantaneous trip.
  - 2. Long- and short-time pickup levels.
  - 3. Long- and short-time time adjustments.
  - 4. Ground-fault pickup level, time delay, and I-squared t response.
- K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- M. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

- N. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- O. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: Mechanical/Compression type, suitable for number, size, trip ratings, and conductor material.
  - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
  - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered or remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 5. Communication Capability: Circuit-breaker-mounted, Universal-mounted or Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 26 0913 "Electrical Power Monitoring and Control."
  - 6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
  - 9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
  - 10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
  - 11. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
  - 12. Electrical Operator: Provide remote control for on, off, and reset operations.
  - 13. Accessory Control Power Voltage: Integrally mounted, self-powered.

## **2.8 MOLDED-CASE SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company.
  - 3. NOARK Electric North America.
  - 4. SIEMENS Industry, Inc.; Energy Management Division.
  - 5. Square D; by Schneider Electric.

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- B. Description: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- C. Standard: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- D. Features and Accessories:
  - 1. Standard frame sizes and number of poles.
  - 2. Lugs:
    - a. Mechanical/Compression type, suitable for number, size, trip ratings, and conductor material.
    - b. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below, 167 deg F rated wire, 194 deg F rated wire, sized according to the 167 deg F temperature rating in NFPA 70.
  - 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
  - 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
  - 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
  - 7. Alarm Switch: One NC contact that operates only when switch has tripped.
  - 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
  - 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
  - 10. Electrical Operator: Provide remote control for on, off, and reset operations.
  - 11. Accessory Control Power Voltage: Integrally mounted, self-powered.

**2.9 ENCLOSURES**

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1 or gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R)
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover or directly operable through the dead front trim of the enclosure (NEMA 250 Type 3R).

The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

- E. Enclosures designated as NEMA 250 Type 4, 4X stainless steel, 12, or 12K shall have a dual cover interlock mechanism to prevent unintentional opening of the enclosure cover when the circuit breaker is ON and to prevent turning the circuit breaker ON when the enclosure cover is open.
- F. NEMA 250 Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor and wet location applications.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

#### **3.2 PREPARATION**

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Architect, Construction Manager and Owner written permission.
  - 4. Comply with NFPA 70E.

#### **3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS**

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.



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5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 with cover attached by Type 316 stainless steel bolts.

**3.4 INSTALLATION**

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Section 26 0548.16 "Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- E. Install fuses in fusible devices.
- F. Comply with NFPA 70 and NECA 1.

**3.5 IDENTIFICATION**

- A. Comply with Section 26 0511 "Requirements for Electrical Installations".
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

**3.6 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform tests and inspections with the assistance of a factory-authorized service representative.
- E. Tests and Inspections for Switches:
  1. Visual and Mechanical Inspection:
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, grounding, and clearances.

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- c. Verify that the unit is clean.
  - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
  - e. Verify that fuse sizes and types match the Specifications and Drawings.
  - f. Verify that each fuse has adequate mechanical support and contact integrity.
  - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
  - i. Verify correct phase barrier installation.
  - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
2. Electrical Tests:
- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
  - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

F. Tests and Inspections for Molded Case Circuit Breakers:

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1. Visual and Mechanical Inspection:
  - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
  - b. Inspect physical and mechanical condition.
  - c. Inspect anchorage, alignment, grounding, and clearances.
  - d. Verify that the unit is clean.
  - e. Operate the circuit breaker to ensure smooth operation.
  - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
    - 1) Use a low-resistance ohmmeter.
      - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
      - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
  - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
  - h. Perform adjustments for final protective device settings in accordance with the coordination study.
2. Electrical Tests:
  - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
  - c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
  - d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
  - e. Determine the following by primary current injection:

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- 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
- 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
- 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
- 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
- f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
- g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
- h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
- i. Verify operation of charging mechanism. Investigate units that do not function as designed.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
4. Perform the following infrared scan tests and inspections and prepare reports:
  - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
  - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
  - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- G. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports.
  1. Test procedures used.

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2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

**3.7 ADJUSTING**

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 0573.16 "Coordination Studies."

**END OF SECTION**