PROJECT MANUAL

PROJECT NUMBER: 01-19

Martin Elementary School Modernization

SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT

March 12, 2019

DOCUMENT 00 01 10

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NOTICE TO BIDDERS

1. Notice is hereby given that the governing board ("Board") of the South San Francisco Unified School District ("District") will receive sealed bids for the following project, Project No. 01-19 ("Project" or "Contract"):

   Martin Elementary School Modernization, Project No. 01-19

   PROJECT WILL INCLUDE PHASING AND CONSISTS OF: site work- installation of kinder play structure and associated path of travel improvements; accessible gates; installation of vehicular gate; landscape improvements; addition of accessible bottle filling stations; Building remodel/upgrade- barrier removal; accessible stairs and ramp; window replacement; kinder and staff restrooms upgrades; furnace replacement; exterior painting.

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

   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.

4. Contract Documents will be available on or after **March 12, 2019**. Contract Documents are available for bidders' review at the Peninsula Builder's Exchange, (650) 591–4486. Plans and specifications can be viewed and downloaded on the District's website at: www.ssfusd.org/mjb Plans and specifications can be purchased directly from ARC, 945 Bryant St. San Francisco, CA 94103 and electronically on Planwell from ARC. Phone (415)-537-2200. www.e-arc.com Reference SSFUSD Project No. 01-19, Martin Elementary School Modernization. SSFUSD contact is Victoria Vargas, vmvargas@ssfusd.org.

5. Sealed bids will be received until **2:00 p.m., April 11, 2019**, at the District Facilities Office, 634 El Camino Real, South San Francisco, California 94080, 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.

6. Pursuant to Public Contract Code section 20111.6, only prequalified bidders will be eligible to submit a bid for contracts $1 million or more using or planning to use state bond funds. Any bid submitted by a bidder who is not prequalified shall be non-responsive and returned unopened to the bidder. Moreover, any bid listing subcontractors holding C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C-42, C-43 or C-46 licenses, if used, who have not been prequalified, shall be deemed nonresponsive and will not be considered

7. 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.

8. 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 South San Francisco 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.

9. A mandatory pre-bid conference and site visit will be held on **March 20, 2019 and March 27, 2019, at 10 a.m**. at Martin Elementary School, California. All participants are required to sign in front of the Administration Building. The site visit is expected to take approximately one hour. Failure to attend one mandatory site visit or tardiness will render bid ineligible.

10. 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.

11. 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.

12. 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>.

13. 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.

14. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on 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.

END OF DOCUMENT

DOCUMENT 00 21 13

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.

South San Francisco 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"):

   Martin Elementary School Modernization, Project 01-19

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. The District has prequalified bidders pursuant to Public Contract Code section 20111.5. 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 Office, 634 El Camino Real, South San Francisco, CA 94080, 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.

18. The District will require all bidders at a minimum to have no serious and willful violations of Labor Code section 6300 et seq., have a workers' compensation experience modification factor of 1.00 or less, and have an injury prevention program instituted pursuant to Labor Code sections 3201.5 or 6401.7 .

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 Victoria Vargas, vmvargas@ssfusd.org. 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 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. Drug-Free Workplace Certification.

i. Tobacco-Free Environment Certification.

j. Hazardous Materials Certification.

k. Lead-Based Materials Certification.

l. Imported Materials Certification.

m. Criminal Background Investigation/Fingerprinting Certification.

n. 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

DOCUMENT 00 31 32

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 South San Francisco 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.

The reports and drawings of physical conditions that may relate to the Project are the following:

Geotechnical Engineering and Geologic Hazards Study prepared by Geosphere Consultants, Inc. dated February 24, 2012.
Analytic Sampling and Testing of Soil prepared by Geosphere Consultants, Inc. dated May 11, 2012.
Appendix A - Boring log
Appendix B - Lab Test Results
Appendix C – Liquefaction

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

GEOTECHNICAL ENGINEERING
AND GEOLOGIC HAZARDS STUDY

Martin Elementary School
New Classroom Buildings, Multi-Purpose Room,
Administration Building, Library, and Site Improvements
35 School Street
South San Francisco, California 94080

Prepared for:

South San Francisco Unified School District
Measure J Bond Program
Facility Building, 398 B Street
South San Francisco, California 94080

Prepared by:

GEOSPHERE CONSULTANTS, INC
2001 Crow Canyon Road, Suite 100
San Ramon, California 94583
Project No. 91-02787-PW

Geosphere Consultants, Inc.
AN ETS COMPANY
Geotechnical Engineering · Engineering Geology
Environmental Management · Water Resources

February 24, 2012

South San Francisco Unified School District
Measure J Bond Program
Facility Building, 398 B Street
South San Francisco, California 94080

Attention: Mr. Bob Collins, Program Manager

Subject: **Geotechnical Engineering and Geologic Hazards Study**
Martin Elementary School
New Classroom Buildings, Multi-Purpose Building,
Administration Building, Library, and Site Improvements
35 School Street, South San Francisco, California 94080
Geosphere Project No. 91-02787-PW

Dear Mr. Collins:

In accordance with your authorization, Geosphere Consultants, Inc. (Geosphere) has completed a Geotechnical Engineering and Geologic Hazards Study for the proposed New Buildings and Site Improvements at Martin Elementary School in South San Francisco, San Mateo County, California. This report has been prepared in accordance with the requirements set forth in California Geological Survey Note 48 and the California Building Code. Transmitted herewith are the results of our findings, conclusions, and recommendations for the design and construction of proposed foundations, interior and exterior concrete slabs, site grading and drainage, temporary trench slope stability, and utility trench backfilling. In general, the proposed improvements at the site are considered to be geotechnically and geologically feasible provided the recommendations of this report are implemented in the design and construction of the project.

Should you or members of the design team have questions or need additional information, please contact the undersigned by email: ejs@geosphereinc.net, gh@geosphereinc.net, or rshrestha@geosphereinc.net or at (925) 314-7180. The opportunity to be of service to South San Francisco Unified School District and to be involved in the design of this project is appreciated.

Sincerely,
GEOSPHERE CONSULTANTS, INC.

Raghubar Shrestha, Ph.D., P.E.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
RAGHUBAR SHRESTHA
No. C73464
Exp. 12-31-12
CIVIL
STATE OF CALIFORNIA

Gregory R. Hanson, GE 2304
Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
GREGORY R. HANSON
No. 2304
Exp. 12/2013
GEOTECHNICAL
STATE OF CALIFORNIA

Eric J. Swenson, GE 2474, CEG 1855
Principal Geotechnical Engineer and
Engineering Geologist

CERTIFIED ENGINEERING GEOLOGIST
ERIC J. SWENSON
No. 1855
Exp. 10/2012
STATE OF CALIFORNIA

Distribution: 4 plus PDF to Addressee, rcollins@ssfusd.org

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Boring Logs

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Liquefaction Analyses

GEOTECHNICAL ENGINEERING AND GEOLOGIC HAZARDS STUDY

Project: **New Classroom Buildings, Multi-Purpose Building, Administration Building, Library, and Site Improvements**
Martin Elementary School

Client: **South San Francisco Unified School District**
Measure J Bond Program
South San Francisco, San Mateo County, California

1.0 INTRODUCTION

1.1 Purpose and Scope

The purposes of this study were to evaluate the geologic hazards and the subsurface conditions at the site and prepare geotechnical recommendations for the proposed new developments. The new development includes construction of new one and two stories classroom buildings, multi-purpose building, administration building, library, and site improvements including pave parking area. This study provides recommendations for the design and construction of new proposed foundations, interior and exterior concrete slabs, site grading and drainage, temporary trench slope stability, paved parking area, and utility trench backfill. This study was performed in accordance with the scope of work outlined in our proposal dated July 26, 2011 with supplemental revised borings number sent by email dated November 21, 2011, and memorandum issued by South San Francisco Unified School District dated December 8, 2011.

The scope of this study included the review of pertinent published and unpublished documents related to the site, a field exploration, laboratory testing, engineering analysis of the accumulated data, and preparation of this report. The conclusions and recommendations presented in this report are based on the data acquired and analyzed during this study, and on prudent engineering judgment and experience. This study did not include an in-depth assessment of potentially toxic or hazardous materials that may be present on or beneath the site.

1.2 Site Description

The proposed project site is located at 35 School Street in South San Francisco, San Mateo County in California, as shown on the attached Figure 1 – Site Location Map. The project site consists of existing classroom buildings, administration building, paved parking area, and baseball field. The proposed project site is in the northwest corner of the intersection of the School Street and the Hillside Boulevard. It is surrounded by residential developments in the north and in the west. The proposed project improvement areas are being used by the school as classrooms,

administration buildings, paved parking, and play area. The proposed improvement area is gently sloped to the southeast. The geographic coordinates of the site improvements are approximately 37.663952 degrees north latitude and 122.409750 degrees west longitude. The site is at an average approximate elevation of 82 feet above mean sea level (Source: Latitude, Longitude and Elevation were recorded from Google Earth).

1.3 Proposed Development

We understand, based on the preliminary construction plan provide by the Client that the proposed construction work includes the demolition of the existing classroom buildings and other structures and construction of new one and two story buildings for classrooms, administration building, multi-purpose building, administration building, library, paved parking area, and drop-off loop and parking including site improvements. We anticipate that the proposed buildings will be light structures ranging from one to two stories only. Note-Sizes of footprint details of plan and structural loads are unknown. Foundation design plans and finished level of different structures/amenities have not been provided at the time of this report preparation. Attached Figure 2 shows the proposed general improvement layout plan.

1.4 Validity of Report

This report is valid for three years after publication. If construction begins after this time period, Geosphere should be contacted to confirm that the site conditions have not changed significantly. If the proposed development differs considerably from that described above, Geosphere should be notified to determine if additional recommendations are required. Additionally, if Geosphere is not involved during the geotechnical aspects of construction, this report may become wholly or in part invalid since Geosphere's geotechnical personnel need to verify that the subsurface conditions anticipated preparing this report are similar to the subsurface conditions revealed during construction. Geosphere's involvement should include foundation and grading plan review; observation of foundation excavations; grading observation and testing; testing of utility trench backfill; subgrade preparation in hardscape areas; and pavement section preparation.

2.0 PROCEDURES AND RESULTS

2.1 Literature Review

Pertinent geologic and geotechnical literature pertaining to the site area was reviewed. These included various USGS, CGS, and other government publications and maps, as listed in the References section.

2.2 Field Exploration

A total of eight borings were drilled at the site on January 6th and 16th, 2011. The borings were drilled up to approximately 50 feet below the existing ground level within the proposed construction site by a truck mounted drill rig equipped with eight-inch hollow-stem auger. All borings were drilled within the proposed new construction areas.

A Geosphere Registered Professional Engineer visually classified the materials encountered in the borings according to the Unified Soil Classification System as the borings were advanced. Relatively undisturbed soil samples were recovered at selected intervals using a three-inch outside diameter Modified California split spoon sampler containing six-inch long brass liners. A two-inch outside diameter Standard Penetration Test (SPT) sampler was used to obtain SPT blow counts and obtain disturbed soil samples. The samplers were driven by using a mechanical-trip, 140-pound hammer with an approximate 30-inch fall utilizing N-rods as necessary. Resistance to penetration was recorded as the number of hammer blows required to drive the sampler the final foot of an 18-inch drive. All of the blow counts recorded using Modified California split spoon samplers in the field were converted to equivalent SPT blow counts using appropriate modification factors suggested by Burmister (1948), i.e. a factor of 0.65 with inner diameter of 2.5 inches. Therefore, the boring logs reported in this report are all equivalent SPT blow counts. Bulk samples were obtained in the upper few feet of the borings from the auger cuttings as needed.

The boring logs with descriptions of the various materials encountered in each boring, the penetration resistance values, and some of the laboratory test results are presented in Appendix A. The ground surface elevations indicated on the soil boring logs are approximate (rounded to the nearest ½ foot) and were estimated from the Google Earth. True surface elevations at the boring locations could differ. The locations and elevations of the borings should only be considered accurate to the degree implied by the means and methods used to define them. The approximate locations of the borings are shown on the Site Plan, Figure 2.

2.3 Laboratory Testing

Laboratory tests were performed on selected samples to determine some of the physical and engineering properties of the subsurface soils. The results of the laboratory testing are presented on the boring logs, and are included in the appendices. The following soil tests were performed for this study:

Dry Density and Moisture Content (ASTM D2937and D2216) – In-situ density and moisture tests are conducted to determine the in-place dry density and moisture content of the subsurface materials. These properties provide information for evaluating the physical characteristics of the subsurface soil.

Atterberg Limits (ASTM D4318 and CT204) - Liquid Limit, Plastic Limit, and Plasticity Index are useful in the classification and characterization of the engineering properties of soil, helps evaluate the expansive characteristics of the soil, and for determining the soil type according to the USCS.

Particle Size Analysis (Wet and Dry Sieve) and Hydrometer (ASTM D422, D1140, and CT202) - Sieve analysis testing is conducted on selected samples to determine the soil particle size distribution. This information is useful for the evaluation of liquefaction potential and characterizing the soil type according to USCS.

Direct Shear (modified ASTM D3080) - Direct shear testing is performed on samples to determine the angle of internal friction and cohesion of soil or rock materials. This data can be utilized in determining allowable bearing capacity, retaining wall design parameters, and strength characteristics of the materials. Direct shear specimens are saturated under a 100-psf surcharge for a period of 24 hours prior to testing.

Unconfined Compressive Strength (ASTM D2166, CT373, and CT312) - Unconfined compression testing is performed on selected cohesive samples to provide an approximation of the undrained shear strength and allowable bearing capacity of the soil.

Soil Corrosivity - Soil corrosivity testing performed by Cooper Testing Laboratory is performed to determine the effects of constituents in the soil on buried steel and concrete. Water-soluble sulfate testing is required by the UBC, CBC, and IBC.

3.0 GEOLOGIC OVERVIEW

3.1 Regional Geologic Setting

The site is located within the Coast Range Geomorphic province of California. The Coast Range extends from the southern and western edge of the Klamath Mountains near the Oregon border, to the Transverse Ranges in southern California, a distance of more than 1000 km; in addition, the geology found in the Coast Ranges continues as basement through the western Transverse Ranges, then offshore from the Peninsular Ranges and Baja California.

The basement rocks of the Coast Ranges Province consist of three linear belts, the eastern Franciscan Assemblage, central Great Valley, and western Franciscan Assemblage. The Franciscan Assemblages consists of graywacke and shale in coherent units, often metamorphosed to blueschist facies, together with melanges composed not only of sheared shale and graywacke blocks but also exotic blocks including, serpentine, chert, greenstone, eclogite, and blueschist, overlain by the Jurassic Coast Range ophiolite , which is in turn depositionally overlain by the Jurassic to Cretaceous Great Valley Sequence of turbidites and fan deposits; The Great Valley sequence is a belt composed of Mesozoic plutons that had intruded metamorphic basement rocks, overlain by younger sediments, and called the Salinian Block. The three belts are separated by major faults, the eastern belt from the Salinian Block by the active San Andreas strike-slip system, and the Salinian Block from the western belt by the Sur-Naciemento fault system, a complex system of apparent strike-slip faults.

3.2 Local Geologic Setting

The basement rocks of the San Francisco Peninsula consist primarily of Franciscan Assemblage rocks. Overlying the Franciscan in depositional contact are the relatively young Cenozoic formations of the Merced and Colma Formations. The Merced and Colma Formations are young (<1.5 MYA old) sediments that are predominately non-marine in origin with occasional marine interbeds. The sediments are granular uncemented deposits that have been uplifted into highland areas by the active tectonics of the nearby San Andreas Fault. As a rock, they are weak and uncemented. Described as a soil, they are considered dense to very dense and have generally very favorable engineering characteristics for shallow foundation structures. Overlying the Merced and Colma Sands are young alluvial deposits adjacent to active channels. In localized areas there has been the placement of artificial fill. Areas close to the Bay Shore line will have soft Bay Mud sediments overlying the alluvial deposits. The mapped geologic units at the site are shown on the Site Vicinity Geologic Map - Figure 3, and Site Plan and Site Geologic Map – Figure2.

4.0 FIELD AND LABORATORY FINDINGS

4.1 Subsurface Conditions

The subsurface conditions of the project site generally consist of lean clay with sand, sandy clay, fat clay, clayey sand, silty sand, and sandy gravel to depths of at least 49 feet below ground level. The findings during our field exploration are consistent with the geological research conducted for the site during the preparation of this report. Our geological research conducted for this site indicated that the proposed area has a past history of placement of artificial fill (af), see Site Geologic Map Figure-2. The upper approximately 20 to 25 feet of the soil profile consists of undocumented very old fills which are predominantly sandy clays and clayey sands. The upper approximately 10 feet of the soils in borings B-1, B-2, and B-4 were stiff or loose. Beside these few stiff or loose areas majority of the subsurface conditions were very stiff, hard or medium dense, dense, and very dense. The soils are olive to dark gray, gray, yellowish brown to brown, and damp to wet. We encountered a layer of fat clay at a depth approximately from 23 ½ to 35 feet in boring B-1 and from 9 ½ to 18 ½ feet in boring B-8. Details of soils encountered in the exploratory boring are included in the boring logs in the appendices. Figure 4a and 4b show the geological cross sections of the proposed development site.

4.2 Groundwater

The historic groundwater table in the project site was not determined during our research of records (DWR, Gregg). We encountered ground water in the borings B-1, B-2, B-3, B-4 B-5, B-7, and B-8 at the depths of 19, 7, 5.5, 4.5, 10, 23 and 18 feet respectively below the ground level measured immediately after completion of drilling operation at each boring. In boring B-6 no ground water was encountered. This indicates that the water encountered in those borings is perched water not the indication of the ground water level in the surrounding area. The perched water/groundwater levels can vary in response to time of year, variations in seasonal rainfall, tidal influence, well pumping, irrigation, and alterations to site drainage.

4.3 Laboratory Test Results

Laboratory test results are included in Appendices B of this report with a summary of Results.

5.0 CORROSIVITY

5.1 Corrosion Test

Corrosion test results of soil samples obtained from the site from the upper 2' to 4' feet below existing ground level were evaluated based on ASTM A888 methods. Table X2.1, Soil-Test Evaluation, from the ASTM procedure is presented below. If the summed points are equal to 10, the soil should be considered corrosive to cast iron pipe. If sulfides are present and low or negative redox potential results are obtained, 3 points shall be given for this range.

Table 1: Corrosion Evaluation Criteria

Soil Characteristics	Points		Soil Characteristics	Points
Resistivity, ohm-cm, based on single probe or water-saturated soil			**Redox Potential, mV**	
<700	10		>+100	0
700-1,000	8		+50 to +100	3.5
1,000-1,200	5		0 to 50	4
1,200-1,500	2		Negative	5
1,500-2,000	1		**Sulfides**	
>2,000	0		Positive	3.5
PH			Trace	2
0-2	5		Negative	0
2-4	3		**Moisture**	
4-6.5	0		Poor drainage, continuously wet	2
6.5-7.5	0		Fair drainage, generally moist	1
7.5-8.5	0		Good drainage, generally dry	0
>8.5	5			

The bulk sample collected from Boring B-5 at a depth between two to four feet had a redox of 334 mV, a pH of 6.4, a resistivity of 3589 ohms-cm, and negative sulfides. The total points for this sample, considering generally moist condition of the soil is 1, which is considered to be soil with a low corrosive potential.

These results are preliminary, and provide information on the specific soils sampled and tested. Other soil at the site may be more or less corrosive. Providing a detailed assessment of the corrosion potential of the site soils is not within our scope of work. Appropriate corrosion specialists should be contacted if a detailed evaluation is required.

5.2 Water-Soluble Sulfates

Water-soluble sulfate can affect the concrete mix design for concrete in contact with the ground, such as shallow foundations, piles, piers, and concrete slabs. The UBC, CBC, and IBC provide the following evaluation criteria:

Table 2: Sulfate Evaluation Criteria

Sulfate Exposure	Water-Soluble Sulfate in Soil, Percentage by Weight or (mg/kg)	Sulfate in Water, ppm	Cement Type	Max. Water Cementitious Ratio by Weight	Min. Unconfined Compressive Strength, psi
Negligible	0.00-0.10 (0-1,000)	0-150	NA	NA	NA
Moderate	0.10-0.20 (1,000-2,000)	150-1,500	II, IP (MS), IS (MS)	0.50	4,000
Severe	0.20-2.00 (2,000-20,000)	1,500-10,000	V	0.45	4,500
Very Severe	Over 2.00 (20,000)	Over 10,000	V plus pozzolan	0.45	4,500

The test results contained less than 5 mg/kg water-soluble sulfate. Hence, the water-soluble sulfate content in the site soil should have negligible impact on buried concrete at the site. However, it should be pointed out that the water-soluble sulfate concentrations can vary due to the addition of fertilizer, irrigation, and other possible development activities. An appropriate expert should be contacted if a detailed evaluation is required.

6.0 GEOLOGIC HAZARDS

6.1 Seismic Induced Hazards

Seismic hazards resulting from the effects of an earthquake generally include ground shaking, liquefaction, lateral spreading, dynamic settlement, fault ground rupture and fault creep, dam inundation, and tsunamis and seiches. The site is not necessarily impacted by all of these potential seismic hazards. Nonetheless, potential seismic hazards are discussed and evaluated in the following sections in relation to the planned construction.

6.1.1 Ground Shaking

The site will likely experience severe ground shaking from a major earthquake originating from the major Bay Area faults, particularly the nearby San Andreas (approximately 3.2 miles from the site) faults or Hayward-Rodgers Creek (approximately 14.5 miles from the site).

6.1.2 Liquefaction Induced Phenomena

Research and historical data indicate that soil liquefaction generally occurs in saturated, loose granular soil (primarily fine to medium-grained, clean sand deposits) during or after strong seismic ground shaking and is typified by a loss of shear strength in the affected soil layer, thereby causing the soil to flow as a liquid. However, because of the higher inter-granular pressure of the soil at greater depths, the potential for liquefaction is generally limited to the upper 40 feet of the soil. Potential hazards associated with soil liquefaction below or near a structure include loss of foundation support, lateral spreading, sand boils, and areal and differential settlement.

Lateral spreading is lateral ground movement, with some vertical component, as a result of liquefaction. The soil literally rides on top of the liquefied layer. Lateral spreading can occur on relatively flat sites with slopes less than two percent under certain circumstances. Lateral spreading can cause ground cracking and settlement.

The site is mapped by the USGS and William Lettis & Associates as being located within a zone of low to very low liquefaction potential (see attached Figure 5). The site is generally underlain by stiff to very stiff sandy clay (CL) and medium dense to very dense clayed sand (SC) and silty sand (SM). The perched groundwater was encountered at a very shallow depth at 4.5 feet below the ground surface level. Due to the shallow ground water table and few layers of potential liquefiable soils profiles we performed liquefaction analyses. Based on the information collected during the field investigation, laboratory test results, and types of soils encountered in the borings within the project site we performed liquefaction analyses for the three different boring locations, B-1, B-2, and B-8 which were considered

to have critical soil profiles. For the analyses we considered maximum considered earthquake magnitude of 7.1, peak ground acceleration (PGA) of 0.5g, and historical ground water level as 4.0 feet below the existing ground level. The analyses results performed by using Liquefy5 indicated no significant liquefaction at the proposed site except a thin layer of clayey sand at depths approximately from 8 to 10 feet below the existing subgrade level in Boring B-8. The settlement due to this liquefaction is less than 0.4 inches which is small and we anticipated that it would have insignificant effect to the building structure/foundation support. The analyses results are shown in the appendix of this report. Nevertheless due to the presence of undocumented fills we have recommended ground improvement for the proposed site, which will be provided in the recommendation section of this report, will further helps to minimize these dynamic settlements.

6.1.3 Consolidation Settlement

Consolidation is the densification of soil into a more dense arrangement from additional loading, such as new fills or foundations. Consolidation of clayey soils is usually a long-term process, whereby the water is squeezed out of the soil matrix with time. Sandy soils consolidate relatively rapidly with an introduction of a load. Consolidation of soft and loose soil layers and lenses can cause settlement of the ground surface or buildings. Based on testing in the field, laboratory testing, type of soils and depth of groundwater level encountered, and a very thick layer of loose to medium dense undocumented clayey sand fills, the surficial soil is considered to have a moderate potential to consolidate. Therefore, the project site should be carefully handled to minimize the consolidation settlements. Remedial measures to control the possible consolidation and differential settlements will be provided in the recommendations section of this report.

6.1.4 Dynamic Compaction (Settlement)

Dynamic compaction is a phenomenon where loose, sandy soil located above the water table densified from vibratory loading, typically from seismic shaking or vibratory equipment. The site is generally underlain by stiff to very stiff sandy clay, and medium dense to very dense silty sand. The soil is sufficiently strong and therefore not likely to be subject to dry sand densification. Thus, the site should not be susceptible to dynamic compaction phenomena.

6.1.5 Fault Ground Rupture and Fault Creep

The State of California adopted the Alquist-Priolo Earthquake Fault Zone Act of 1972 (Chapter 7.5, Division 2, Sections 2621 – 2630, California Public Resources Code), which regulates development near active faults for the

purpose of preventing surface fault rupture hazards to structures for human occupancy. In accordance with the Alquist-Priolo Act, the California Geological Survey established boundary zones or Earthquake Fault Zone surrounding faults or fault segments judged to be sufficiently active, well-defined, and mapped for some distance. Structures for human occupancy within designated Earthquake Fault Zone boundaries are not permitted unless surface fault rupture and fault creep hazards are adequately addressed in a site-specific evaluation of the development site.

The site is not currently within a designated Earthquake Fault Zone as defined by the State (Hart and Bryant, 1997). The closest Earthquake Fault Zone is associated with San Andreas Fault, located about 3.2 miles from the site (see Regional Fault Map, Figure 6). Since the site is not within an Earthquake Fault Zone, the potential for fault ground rupture and fault creep hazards are judged to be very low.

6.2 Other Hazards

Potential geologic hazards other than those caused by a seismic event generally include ground failure and subsidence, landslides, expansive and collapsible soils, flooding, and soil erosion. These are discussed and evaluated in the following sections.

6.2.1 Ground Cracking and Subsidence

Withdrawal of groundwater and other fluids (i.e. petroleum and the extraction of natural gas) from beneath the surface has been linked to large-scale land subsidence and associated cracking on the ground surface. Other causes for ground cracking and subsidence include the oxidation and resultant compaction of peat beds, the decline of groundwater levels and consequent compaction of aquifiers, hydrocompaction and subsequent settlement of alluvial deposits above the water table from irrigation, or a combination of any of these causes. Determining the impacts from subsidence on the project is beyond the scope of this study however, subsidence generally impacts a region, and should not produce excessive differential settlement in a single location. Local and regional locations prone to subsidence generally subside equally over time. Due to the presence of high ground water level and loose to medium undocumented fills some degree of settlement in the project site is very likely due to localized consolidation over time, not by regional subsidence. Consolidation settlement will be addressed in the engineering recommendation sections.

6.2.2 Landsliding

The site is not yet evaluated by CGS sources as being located within an existing landslide or potential landslide area. Based on the USGS rainfall induced landslide map and surrounding topography, the site is not considered prone to potential landslide. See attached USGS landslide map, Figure 7.

6.2.3 Expansive and Collapsible Soils

The result of the laboratory testing performed on representative sample of the near-surface soils (less than 10-feet deep) indicated Plasticity Index 18 which is considered as low-plastic. Hence, mitigation for expansive soil conditions is not required for this site.

The subsurface deposits encountered during the drilling program generally consisted of loose to very dense clayey sand to silty sandy/poorly graded sand. Collapsible soils are fine sandy and silty soils that have been laid down by the action of flowing water, usually in alluvial fan deposits. Terrace deposits and fluvial deposits can also contain collapsible soil deposits. The soil particles are usually bound together with a mineral precipitate. The loose structure is maintained in the soil until a load is imposed on the soil and water is introduced. The water breaks down the inter-particle bonds and the newly imposed loading densifies the soil. The potential for collapsible soils underlying the site is considered to be low due to the presence of medium dense to very dense soils.

6.2.4 Flooding

The site is located in an area of minimal flooding hazard. FIRM (2009) has mapped the site vicinity as Zone C, areas determined to be above the 500-year flood level, see attached Figure 8. Based on the site's proximity to this Flooding Zone, the topography of the proposed construction site, and the groundwater level during field exploration, the site can be considered to have a moderate hazard potential for seasonal flooding, especially during rainy season. Determining the flood hazard of the site is beyond the scope of this study or our expertise, and a flood specialist should be contacted if a more in-depth flooding analysis is desired.

6.2.5 Soil Erosion

Present construction techniques and agency requirements have provisions to limit soil erosion and resultant siltation during construction. These measures will reduce the potential for soil erosion at the site during the various construction phases. Long-term erosion at the site will be reduced by landscaping and hardscape areas, such as parking lots and walkways, designed with appropriate surface drainage facilities.

6.2.6 Naturally Occurring Asbestos (NOA)

The geologic mapping of the area includes Franciscan Complex sedimentary rocks, Early Cretaceous and/or Late Jurassic and Franciscan Complex mélange, Eocene, Paleocene, and Late Cretaceous to the immediate north, west, and east of the site. This formation contains ultra-mafic rocks and serpentine outcrops which may contain naturally occurring asbestos. Greenish gray loose to dense layers of clayey sand and silty sand were encountered in some of the borings approximately at the depths between 20 to 35 feet. However exposed bedrock outcrops were not visually observed in the proposed building areas. Furthermore, due to the thicker capping layer of soils above these greenish soils, the asbestos hazard potential at the site is anticipated to be low.

6.2.7 Other Geologic Hazards

Due to the sites location, subsurface soil conditions, groundwater levels and land use factors, the site is not subject to the potential geologic hazards of loss of mineral resources, volcanism, tsunamis, seiches, dam failure inundation, cyclic softening of soils or loss of unique geologic features.

7.0 SEISMIC SETTING

7.1 Regional Faulting and Tectonics

Regional transpression has caused uplift and folding of the bedrock units within the Coast Ranges. This structural deformation occurred during periods of tectonic activity that began in the Pliocene and continues today. The site is located in a seismically active region that has experienced periodic, large magnitude earthquakes during historic times. This seismic activity appears to be largely controlled by displacement between the Pacific and North American crustal plates, separated by the San Andreas Fault zone, located approximately 3.2 miles west of the site. This plate displacement produced regional strain that is concentrated along major faults of the San Andreas Fault System including the San Andreas and Hayward faults in this area. Major faults include the San Andreas Fault, located approximately 3.2 miles southwest of the site and Hayward-Rodgers Creek Fault located approximately 14.5 miles east of the site.

7.1.1 San Andreas Fault

The northwest-trending San Andreas Fault runs along the western coast of California extending approximately 625 miles from the north near Point Arena to the Salton Sea area in Southern California (Jennings, 1994). The fault zone has been divided into 11 segments. The site is located approximately 3.2 miles to the San Francisco Bay Peninsula area. The slip rate on the nearest segment of the San Andreas Fault is estimated to be about 17 mm/year and has been assigned a moment magnitude (M_{max}) of 7.1 (CGS, 2003). The Working Group on California Earthquake Probabilities (WG99) has estimated that there is a 15 percent probability of at least one magnitude 6.7 or greater earthquake before 2030 along the Bay area of the San Andreas Fault (USGS, 1999).

7.1.2 Hayward –Rodgers Creek Fault

The Hayward –Rodgers Creek Fault trends northwesterly from the Milpitas area via Richmond to the Santa Rosa area. The site is located approximately 14.5 miles from the segment of the Hayward-Rodgers Creek Fault. The slip rate on this segment of the Hayward Fault is estimated to be about nine mm/year and has been assigned a moment magnitude (M_{max}) of 6.7 (CGS, 2003). The Working Group on California Earthquake Probabilities (WG99) has estimated that there is a 27 percent probability of at least one magnitude 6.7 or greater earthquake before 2030 along the Southern segment of the Hayward-Rodgers Creek Fault (USGS, 2003).

8.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based upon the analysis of the information gathered during the course of this study and our understanding of the proposed improvements.

The site is considered suitable from a geotechnical and geologic perspective for the proposed improvements provided the recommendations of this report are incorporated into the design and implemented during construction. The predominant geotechnical and geological issues that will need to be addressed at this site are summarized below.

8.1 General

8.1.1 Seismic Considerations

The site is located within a seismically active region and should be designed to account for earthquake ground motions, as described in this report. For seismic analysis of the proposed site in accordance with the seismic provisions of the CBC 2010, we recommend the following:

Table 3: Seismic Design Parameters Based on 2010 CBC (2009 IBC)

Item	Value	Location
Site Class	D	Table 1613.5.2[R1]
Mapped Spectral Response Accelerations Short Period, Ss 1-second Period, S1	 1.863 g 0.966 g	USGS [R2]
Site Coefficient, Fa	1.0	Table 1613.5.3(1) [R1]
Site Coefficient, Fv	1.5	Table 1613.5.3(2) [R1]
MCE (S_{MS})	1.863 g	
MCE (S_{M1})	1.449 g	
Design Spectral Response Acceleration Short Period, S_{DS} 1-second Period, S_{D1}	 1.242 g 0.966 g	

R1 California Building Standards Commission (CBSC), "California Building Code," 2010 Edition.
R2 U.S. Seismic "Design Maps" Web Application,

https://geohazards.usgs.gov/secure/designmaps/us/application.php

8.2 Site Grading and Improvement

8.2.1 Site Preparation and Demolition

Site grading should be performed in accordance with these recommendations. A pre-construction conference should be held at the jobsite with representatives from the owner, general contractor, grading contractor, and Geosphere prior to starting the stripping and demolition operations at the site.

The proposed construction work includes demolition of existing modular buildings, removal of asphalt pavement, and top soils. The site should be cleared of any foundation remains, concrete, asphalt, vegetation, organic topsoil, debris, and other deleterious materials within the proposed development areas. The grading contractor should be aware that there is a potential for encountering buried objects and underground utilities at the site.

Buried objects and debris should be removed from the site. The resulting excavations should be backfilled with properly compacted fill or other material approved by the Geotechnical Engineer. Soil from the over-excavation areas can be stockpiled and utilized for fill at the site if the material is non-expansive and meets the requirements of backfill materials.

Existing underground utilities to be abandoned at the site should be properly grouted closed or removed as needed. If the utilities are removed, the excavations should be backfilled with properly compacted fill or other material approved by the Geotechnical Engineer.

8.2.2 Project Compaction Recommendations

The following table provides the recommended minimum compaction requirement for this project. Not all soils, aggregates, and scenarios listed below may be applicable for this project. Specific grading recommendations will be discussed individually within applicable sections of this report.

Table 4: Project Compaction Requirements

Description	Percent Relative Compaction	Optimum Moisture Content
Building Pads, Onsite Soil	90	+ 3
Building Pads, Subgrade Soil	90	+ 3
Building Pads, Class 2 Baserock	90	± 3
Concrete Hardscape, Subgrade Soil	90	+ 3
AC and Concrete Pavement, Subgrade Soil	95	+ 3

Description (continued)	Percent Relative Compaction	Optimum Moisture Content
AC and Concrete Pavement, Class 2 Baserock	95	± 3
Underground Utility Backfill, 5-Feet and Deeper	90	± 3
Underground Utility Backfill, Upper 5-Feet	95	+ 3

8.2.3 General Grading

Site grading is anticipated to consist of minimum cuts and fills depending upon the preliminary planned finished floor levels. No final grading plans were available at the time this report was prepared. On site soils are generally stiff and medium dense on the upper 5 feet. However in some areas we encountered loose soils during our field exploration. These soils should be replaced with suitable engineered/import fills within the proposed building footprint areas and five feet around. Imported soil should be non-expansive, having a Plasticity Index of 15 or less, an R-Value greater than 40, and contain at least 10 percent fines so the soil can bind together. Imported materials should be free of organic materials and debris, and should not contain rocks or lumps greater than three inches in maximum size. Import fill materials should be approved by the Geotechnical Engineer prior to use on site.

Final grading should be designed to provide positive drainage away from structures. Soil areas within 10 feet of proposed structures should slope at a minimum of five percent away from the buildings. Roof leaders and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system channeled away from the structure to an approved collector or outfall.

8.2.4 Building Pad Grading/Preparation

Following demolition and general grading the entire area of the building should be overexcavated at least four feet below the finished subgrade level or 24 inches below the bottom of the footings and replaced with properly compacted engineered fills with geogrids as recommended. The area of excavation should be extended at least five feet outside the building perimeter. If loose/soft soil is encountered below the recommended depth of excavations, these areas should be over-excavated and replaced with Engineered Fill. Before placement of the engineering fill two layers of Geogrid-TriAx TX160 or equivalent should be place at an interval of 12 inches from the bottom of the compacted base of the excavation. The soil should be properly moisture conditioned and compacted to a minimum of 90 % relative compaction per ASTM D 1557. Engineered fill should be placed in maximum eight-inch thick lifts. The fill should be thoroughly mixed during placement to provide uniformity in each layer. The intent of this subsoil improvement is to eliminate any soft or loose pocket of soil from within the proposed building area and minimize the

potential differential settlements that might cause due to the undocumented fills. Furthermore this subsoil improvement will provide firm, stable, and improves the bearing capacity of the foundation. With this improvement shallow conventional footings can be used to transfer building loads to the foundation.

8.2.5 Grading Hardscape Areas

Areas to receive concrete hardscapes should be scarified to a depth of eight inches below existing grade or final subgrade whichever is lower. Scarified areas should be moisture conditioned and compacted. Engineered fill should be placed to reach subgrade elevation as needed.

8.2.6 Grading Paved Areas

The exposed subgrade soil in paved areas should be scarified at least 8 inches, moisture conditioned, and compacted. Engineered fill should be placed to reach subgrade elevation, as required. Once the compacted subgrade has been reached, it is recommended that baserock in paved and on-grade concrete slab areas be placed immediately to protect the subgrade. Alternatively, the subgrade should be kept moist by watering until baserock is placed.

Rubber-tired heavy equipment, such as a full water truck, should be used to proof load exposed pavement subgrade areas where pumping is suspected. Proof loading will determine if the subgrade soil is capable of supporting construction equipment without excessive pumping or heaving. Soft or loose soil encountered during proof-rolling will require over-excavation and recompaction with additional aggregate baserock. Recommendations for mitigation, if needed, will be made in the field during grading.

8.2.7 Site Winterization and Unstable Subgrade Conditions

If grading occurs in the winter rainy season, unstable and unworkable subgrade conditions may be present and compaction of on-site soils may not be feasible. These conditions may be remedied using soil admixtures, such as cement/lime or other admixtures. More detailed recommendations can be provided during construction. Stabilizing subgrade in small, isolated areas can be accomplished with the approval of the Geotechnical Engineer by over-excavating one foot, placing Tensar BX1100 or equivalent geogrid on the soil, and then placing 12-inches of Class 2 baserock on the geogrid. The upper six inches of the baserock should be compacted to at least 95 percent relative compaction.

8.3 Utility Trench Construction

Utility trenches may be backfilled with approved native soil above the utility bedding and shading materials. If rocks larger than four inches in maximum size are encountered, these should be removed from the fill prior to placement in the utility trenches. Utility bedding and shading compaction requirements should be in conformance with the requirements of the local agencies having jurisdiction and as recommended by the pipe manufacturers. Jetting of trench backfill is not recommended.

Pea gravel, rod mill (pea gravel with sand), or other similar self-compacting material should NOT be utilized at the site. This material may act as a conduit for subsurface moisture migration. Utility trenches should be sealed with concrete, clayey soil, sand-cement slurry, or controlled density fill (CDF) where the utility enters the building under the perimeter foundation. This would reduce the potential for migration of water beneath the building through the shading material in the utility trench.

If rain is expected and the trench will remain open, the bottom of the trench may be lined with one to two inches of gravel. This would provide a working surface in the trench bottom. The trench bottom may have to be sloped to a low point to pump the water out of the trench.

8.4 Temporary Excavations

The contractor should utilize proper Cal OSHA methods during construction. Excavations in soil more than five feet deep and less than 20 feet deep should have side slopes constructed at 1.5H: 1V (horizontal to vertical). The grading contractor should make selection of temporary side slopes based upon the materials encountered during the excavation. Maximum slope ratios provided above are assumed to be uniform from top to toe of the slope. Adequate provisions should be made to prevent water from ponding on top of the slope and from flowing over the slope face. Surcharge loads should not be permitted within 10 feet of the top of the slope. Desiccation or excessive moisture in the excavation could reduce stability and require shoring or laying back side slopes.

8.5 Building Foundations

With the subsoil/ground improvement as recommended in Section 8.2.4 the proposed new buildings can be constructed on shallow foundations founded at least 24 inches below final exterior grade for perimeter footings and 18 inches below the lowest adjacent finished grade for interior footings. For the design of footings bearing within tested and approved new fill or deeper perimeter footings on stiff/dense native soil we recommend using an

allowable bearing pressure of 2500 psf for dead plus live loads. A one-third increase in allowable dead plus live load bearing pressure may be used when considering the effects of temporary wind or seismic forces. These recommendations are based on the assumptions that the buildings are light structures and anticipated isolated footing load 35 kips or less and 3 to 5 kips/ft for continuous footing. If structural loads are expected to be heavier than above indicated footings load, Geosphere Engineer should be consulted for most economic and appropriate allowable bearing capacity and settlements during design phase.

Resistance to lateral loads may be developed by friction acting at the base of footings and passive earth pressure developed on the sides of footings below grade. Passive earth pressure and friction may be used in combination, without reduction, in evaluating total resistance to lateral loads. An allowable coefficient of friction of 0.30 may be used for dead load forces for footings cast directly against approved compacted fill. An allowable passive pressure of 200 pounds per square foot per linear foot of footing embedment may be used for the sides of footings, provided the footings are poured tight against approved compacted fill or competent natural soils.

Geosphere personnel should be retained to observe and evaluate that footing excavations terminate in soils suitable for the design bearing pressure. If unsuitable soil is present, the excavation should be extended until suitable material is encountered. Unsuitable soil or fill removal should also extend at least eight inches beyond the foundation edge for each 12-inch thickness of unsuitable soil being removed. The material removed should be replaced with an approved granular soil, placed and compacted.

If site preparation and foundation observation services are conducted as outlined in this report, long-term settlement is expected to be less than one inch for footings bearing within the materials described above. Differential settlement across the structure is not expected to exceed about ½ this value.

Continuous footings should have a minimum width of at least 18 inches, and isolated column footings should have a minimum width of at least 24 inches. For continuous footings, we recommend minimum reinforcement of two #4 rebars, at the top and bottom of the footing be used. For isolated footings, we recommend minimum reinforcement of #4 rebars 12–inches on center be used. Actual required footing reinforcement should be determined by the project Structural Engineer.

To reduce moisture changes beneath the footing soils, we recommend that perimeter footings bear at least 30 inches below final exterior grade. Interior footings may be placed at shallower depths. Care should be taken to

prevent wetting or drying of the bearing materials during construction. Any extremely wet or dry material, or any loose or disturbed material in the bottom of the footing excavations, should be removed prior to placing concrete.

8.6 Floor Slab Subgrade

Generally, a building such as proposed for this site is designed for post-construction vertical floor slab movements of less than ½ inch. The near surface soils encountered in the borings were low to moderate plastic soils. Based on correlations with Atterberg Limits testing and soil classifications these soils are expected to exhibit "moderate" expansion potential with variations in the subgrade moisture content. However, based on the measured in-situ moisture contents and dry densities, the near surface soils are considered unsuitable for providing direct support for floor slabs in their current condition (without additional site preparation/re-compaction).

After stripping the site, the building area should be over-excavated and replaced with Engineered Fill to a minimum depth of 12 inches below the bottom of the proposed floor slab subgrade. We recommend minimum thickness of the slab be five inches. The actual required slab thickness and reinforcement should be determined by the project Structural Engineer.

Care should be taken to maintain the minimum recommended moisture content in the subgrade until floor slabs and/or Engineer Fills are constructed. Positive drainage should also be developed away from the building to prevent water from ponding along the perimeter and affecting future floor slab performance. We recommend a positive cutoff in utility trenches at the building lines to reduce the potential for water migrating through the utility trench backfill to areas under the building.

8.6.1 Interior Concrete Slabs

Floors with moisture sensitive floor coverings should be underlain by a high quality vapor retarder meeting ASTM E1745 Class C requirements, such as 15 – mil StegoWrap, Griffolyn Type 65, Griffolyn VaporGaurd, Moistop Ultra C, or equivalent. The vapor retarder can be placed directly on the prepared subgrade soil. ASTM E1643 should be utilized as a guideline for the installation of the vapor retarder. A capillary rock layer or rock cushion is not required beneath the floor slab and a sand layer is not required over the vapor retarder. If sand on top of the vapor retarder is required by the design engineers, the thickness should be minimized to less than one-inch. If construction occurs in the winter months, water may pond within the sand layer since the vapor retarder may prevent the vertical percolation of rainwater.

8.6.2 Exterior Concrete Flatwork

Exterior concrete flatwork with pedestrian traffic should be at least five-inches thick and should be underlain by at least four-inches of Class II AB. The flatwork should be reinforced to reduce potential tripping hazards; welded wire mesh should not be utilized. The flatwork should be doweled into the building foundation adjacent to doorways and into curbs to prevent possible tripping hazards.

If possible, the building should have a concrete apron around the building to reduce the potential for surface water percolating down through the soil adjacent to the buildings. Landscaping adjacent to the building should be avoided if possible. Typically, landscape areas adjacent to buildings are surrounded by concrete flatwork, which keeps irrigation and rainwater from flowing away from the building. The ponded water trapped by the surrounding flatwork could percolate down or possibly laterally through perimeter foundation construction joints or pipe sleeves and travel beneath the floor slab. Drainage can be provided in these landscape areas, but the top of the drains should be located below the building pad subgrade elevation.

8.7 Pavement Design

Detailed plans and finished levels of the pavements are unknown. More accurate and economic pavement sections can be provided if detailed information is available. The pavement sections recommended here in this report can be used for bidding purposes. Geosphere should be consulted for detail design during construction phase.

The near surface soils at the boring locations in the proposed area generally consisted of stiff/loose to medium dense sandy clays and clayey sand. Recommendations regarding subgrade preparation are provided in the following paragraphs.

Site preparation for the proposed pavement areas should include removing any existing vegetation, topsoil, existing pavements, existing foundations, existing floor slabs and any other unsuitable materials encountered. Loose materials in depressions or excavations should also be removed. The depressions or excavations should be backfilled with approved engineering soils. A representative of the Geotechnical Engineer should observe the subgrade preparation.

After site stripping and completing any required cuts or fills, we recommend the top eight inches of the subgrade should be scarified and be compacted to at least 95 percent of the material's maximum dry density in accordance with ASTM D 1557 (current edition). If fill is required to develop final grade lines, it should consist of approved

materials which are free of organic matter and debris. These fill materials should conform to the plasticity specifications for low volume change soil.

Although the proposed rehabilitation and new pavement locations are not clearly identified yet, any new pavement added to replace that damaged or removed during construction should match the adjacent existing section or may utilize the following design parameters. Recommendations for the design of asphalt concrete pavement sections were developed in accordance with the procedures outlined in the latest edition of the Caltrans Highway Design Manual. The Caltrans design method uses Traffic Indices (TI) to represent anticipated wheel loads and frequency of usage for a given design life. A design life of 20 years is typically used in California. Based on designed 20 years life and Traffic Index (TI), we have also estimated the approximate number of equivalent Single Axle Load (ESAL) that the pavement can withstand during its service life.

Based on our experiences with similar type of soils, an R-Value of 15 was used for the design purpose due to anticipated material variation across the site. A Traffic Index (TI) of 5.0 and 6.0 was considered for light traffic (car, van, SUV) and truck/buses driveway/parking respectively. Based on the analysis, the following are the recommended structural thicknesses of the asphalt concrete (AC) pavement sections.

Traffic	Asphalt Concrete (in)	Class 2 AB (in)	Total Section (in)
Light Traffic (5.0) (Approximate, ESAL = 7,000)	3	8	11
Truck/Bus Traffic (6.0) (Approximate, ESAL = 30,000 ESAL)	3.5	11	14.5

Asphalt concrete pavement should be designed and constructed per Caltrans standards. The asphalt pavement should be placed in minimum 1-1/2 inch thick compacted lifts and maximum four-inch thick lifts.

Minimizing subgrade saturation is an important factor in maintaining subgrade strength. Water allowed to pond on or adjacent to pavements could saturate the subgrade and cause premature pavement deterioration. The pavement should be sloped to provide rapid surface drainage, and positive surface drainage should be maintained away from the edge of the paved areas. Design alternatives which could reduce the risk of subgrade saturation and improve long-term pavement performance include crowning the pavement subgrades to drain toward the edges rather than to the center of the pavement areas; and installing surface drains next to any areas where surface water could pond. Properly designed and constructed subsurface drainage will reduce the time subgrade soils are saturated and can

also improve subgrade strength and performance. In areas where there will be irrigation adjacent to pavements, we recommend the owner consider installing perimeter drains for the pavements.

Periodic maintenance extends the service life of the pavement and should include crack sealing, surface sealing and patching of any deteriorated areas. Also, thicker pavement sections could be used to reduce the required maintenance and extend the service life of the pavement. The owner/user should consider placing signs at entryways to deter heavy duty trucks from light duty pavement areas, or by extending concrete curbs to a depth of 12-inches below the pavement subgrade.

8.8 Plan Review

It is recommended that Geosphere be provided the opportunity to review the foundation, grading, and drainage plans prior to construction. The purpose of this review is to assess the general compliance of the plans with the recommendations provided in this report and the incorporation of these recommendations into the project plans and specifications.

8.9 Observation and Testing During Construction

It is recommended that Geosphere/CEL be retained to provide observation and testing services during site preparation, site grading, utility construction, foundation excavation, pavement section preparation and to observe final site drainage. This is to observe compliance with the design concepts, specifications and recommendations, and to allow for possible changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

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LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report are based upon the soil and conditions encountered in the borings. If variations or undesirable conditions are encountered during construction, Geosphere/CEL should be contacted so that supplemental recommendations may be provided.

This report is issued with the understanding that it is the responsibility of the owner or his representatives to see that the information and recommendations contained herein are called to the attention of the other members of the design team and incorporated into the plans and specifications, and that the necessary steps are taken to see that the recommendations are implemented during construction.

The findings and recommendations presented in this report are valid as of the present time for the development as currently proposed. However, changes in the conditions of the property or adjacent properties may occur with the passage of time, whether by natural processes or the acts of other persons. In addition, changes in applicable or appropriate standards may occur through legislation or the broadening of knowledge. Accordingly the findings and recommendations presented in this report may be invalidated, wholly or in part, by changes outside our control. Therefore, this report is subject to review by Geosphere/CEL after a period of three (3) years has elapsed from the date of issuance of this report. In addition, if the currently proposed design scheme as noted in this report is altered, Geosphere/CEL should be provided the opportunity to review the changed design and provide supplemental recommendations as needed.

Recommendations are presented in this report which specifically request that Geosphere/CEL be provided the opportunity to review the project plans prior to construction and that we be retained to provide observation and testing services during construction. The validity of the recommendations of this report assumes that Geosphere/CEL will be retained to provide these services.

This report was prepared upon your request for our services, and in accordance with currently accepted geotechnical engineering practice. No warranty based on the contents of this report is intended, and none shall be inferred from the statements or opinions expressed herein.

The scope of our services for this report did not include an environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on,

below or around this site. Any statements within this report or on the attached figures, logs or records regarding odors noted or other items or conditions observed are for the information of our client only.

FIGURES

Figure 1 – Site Location Map
Figure 2 – Site Plan and Site Geologic Map
Figure 3 – Site Vicinity Geologic Map
Figures 4a and 4b – Schematic Geologic Cross Sections A-A' and B-B'
Figure 5 – Liquefaction Susceptibility Map
Figure 6 – Regional Fault Map
Figure 7 – Existing Landslide Map
Figure 8 – Flood Hazard Map

APPENDIX A

Boring Logs

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Geosphere Consultants, Inc.
2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-1

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/6/12 **COMPLETED** 1/6/12
GROUND ELEVATION 83 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 19.00 ft / Elev 64.00 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**TOPSOIL/GRASS (BASEBALL FIELD)**										
		(CL) **LEAN CLAY w/ SAND (FILL):** Dark gray, moist, very stiff, and w/ traces of gravel	MC B1-1		6-8-10 (18)							
		becomes stiff, w/ brown stains and traces of gravel	MC B1-2		5-6-7 (13)		108	19				
5												
		becomes very moist to wet and w/ gravel	MC B1-3		6-6-8 (14)		104	22	33	18	15	80
10												
		no gravels	MC B1-4		3-4-7 (11)							
15												
		▼ (SC) **CLAYEY SAND:** Greenish gray, wet, very dense, and w/ gravels	MC B1-5		27-35-18 (53)							
20												
		(CH) **FAT CLAY:** Greenish gray, wet, and stiff	MC B1-6		5-6-8 (14)		101	24				
25												

(Continued Next Page)

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2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-1

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
		(CH) **FAT CLAY:** Greenish gray, wet, and stiff *(continued)*										
			MC B1-7		6-7-8 (15)							
30												
		becoming hard	MC B1-8		9-14-36 (50)							
35		(SM) **SILTY SAND:** Greenish gray, wet, and dense										
		(SC) **CLAYEY SAND:** Gray brown, wet, very dense, and w/ gravels	SPT B1-9		14-26-48 (74)							
40												
45												
		(GP) **SANDY GRAVEL:** Reddish brown, moist, and very dense 50 blows for 6"	SPT B1-10		17-50							
50		Bottom of borehole at 50.0 feet.										

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San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-2

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/16/12 **COMPLETED** 1/16/12
GROUND ELEVATION 85 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 7.00 ft / Elev 78.00 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**TOPSOIL/GRASS (BASEBALL FIELD)**										
		(SC) **CLAYEY SAND (FILL):** Olive gray, moist, and medium dense	MC B2-1		4-7-7 (14)							
			MC B2-2		3-4-5 (9)		105	21				
5		(SC) **CLAYEY SAND (FILL):** Brown/gray, wet, and loose to medium dense										
		becomes yellowish brown, and medium dense	MC B2-3		5-7-9 (16)							48
10												
		(CL) **SANDY CLAY (POSSIBLY FILL):** Gray, wet, and stiff	MC B2-4		4-6-7 (13)				24	15	9	52
15												
			MC B2-5		4-5-6 (11)							
20		(CL) **SANDY CLAY :** Gray, wet, stiff to hard, and w/ traces of small gravels										
			MC B2-6		16-19-25 (44)							
25		(SM) **SILTY SAND:** Yellowish brown, moist, and dense										
		Bottom of borehole at 25.0 feet.										

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2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-3

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/16/12 **COMPLETED** 1/16/12
GROUND ELEVATION 85 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 5.50 ft / Elev 79.50 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**4.5" ASPHALT (BASEBALL COURT)**										
		4.5" AGGREGATE BASE										
		(SM) **SILTY SAND:** Yellowish brown, moist, and very dense	MC B3-1		18-49		114	15				
		75 blows for 5.5"										
5			MC B3-2		20-33-48 (81)							
		▼										
		75 blows for 5.5"	MC B3-3		27-49							
10		becomes wet, continuing in very dense silty sand										
15		becomes reddish brown, very dense silty sand										
		50 blows for first 6"	SPT B3-4		50							
20		Bottom of borehole at 20.0 feet.										

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Geosphere Consultants, Inc.
2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-4

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/6/12 **COMPLETED** 1/6/12
GROUND ELEVATION 83 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 4.50 ft / Elev 78.50 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**4" ASPHALT (BASEBALL COURT):**										
		5" AGGREGATE BASE:										
		(CL) **SANDY CLAY (FILL):** Dark gray, moist, and very stiff	MC B4-1		7-7-8 (15)							
		(CL) **SANDY CLAY (FILL):** Grayish brown, wet, stiff, and w/ traces of gravel										
5		▼	MC B4-2		5-5-5 (10)							
		(CL) **SANDY CLAY :** Brown/gray mottled, wet, and very stiff	MC B4-3		10-11-11 (22)		113	17				
10												
		(SC) **CLAYEY SAND:** Gray, moist, and medium dense	MC B4-4		7-8-11 (19)							
15												
		becomes wet and very dense	MC B4-5		11-14-46 (60)							
20												

Bottom of borehole at 21.0 feet.

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2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-5

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/16/12 **COMPLETED** 1/16/12
GROUND ELEVATION 82 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 10.00 ft / Elev 72.00 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**12" TOPSOIL/GRASS (BASEBALL FIELD)**										
		(SC) **CLAYEY SAND (FILL):** Olive gray/ brown, moist, and medium dense	MC B5-1		4-5-7 (12)							
5		(CL) **SANDY CLAY (FILL):** Yellowish brown, moist, hard, and w/ traces of gravel	MC B5-2		11-20-31 (51)		120	13				
		becomes very stiff	MC B5-3		5-8-7 (15)							
10		▼ (CL) **SANDY CLAY (FILL):** Yellowish brown/gray mottled, very moist, and very stiff										
		(CL) **SANDY CLAY (FILL):** Gray, moist, and very stiff	MC B5-4		7-9-12 (21)							
15												
		(ML) **SANDY SILT (FILL) :** Gray/ dark gray, wet, stiff, w/ decayed roots	MC B5-5		5-6-5 (11)				NP	NP	NP	56
20												
		(SM) **SILTY SAND:** Gray, wet, dense, and w/ traces of clay	SPT B5-6		12-17-24 (41)							
25												

(Continued Next Page)

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Telephone: 925-314-7100
Fax: 925-855-7140

BORING NUMBER B-5

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
		(SM) **SILTY SAND:** Gray, wet, dense, and w/ traces of clay *(continued)*										
30		(SM) **SILTY SAND:** Gray, wet, very dense, and w/ olive brown gravels bottom 2" clean silty sand	SPT B5-7		25-20-41 (61)							

Bottom of borehole at 30.0 feet.

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BORING NUMBER B-6

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/16/12 **COMPLETED** 1/16/12
GROUND ELEVATION 81 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING --- Grounwater not encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**12" TOPSOIL/GRASS (BASEBALL FIELD)**										
		(CL) **SANDY CLAY (FILL):** Olive gray/brown, moist, very stiff, and w/ traces of gravels	MC B6-1		7-10-12 (22)							
5			MC B6-2		8-11-14 (25)							
		(CL) **SANDY CLAY (POSSIBLY FILL):** Olive brown, moist, and very stiff										
10			MC B6-3		9-11-14 (25)		101	20				
		(CL) **SANDY CLAY (POSSIBLY FILL):** Gray/ brown, moist, and very stiff	MC B6-4		8-12-11 (23)							
15												
20		(SC-SM) **SANDY CLAY/CLAYEY SAND:** Gray, wet, stiff/medium dense, and w/ traces of small gravels	SPT B6-5		5-6-6 (12)							
		(CL) **LEAN CLAY WITH SAND :** Gray, wet, and stiff	SPT B6-6		4-5-5 (10)							75
25												

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BORING NUMBER B-6

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
		(CL) **LEAN CLAY WITH SAND :** Gray, wet, and stiff *(continued)*										
30		(CL) **SANDY CLAY :** Gray, wet, and stiff	SPT B6-7		4-4-9 (13)							
35		(SM) **SILTY SAND :** Gray, wet, and medium dense	SPT B6-8		7-8-14 (22)							
		Bottom of borehole at 36.5 feet.										

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BORING NUMBER B-7

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/16/12 **COMPLETED** 1/16/12
GROUND ELEVATION 80 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 23.00 ft / Elev 57.00 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**18" TOPSOIL/GRASS (BASEBALL FIELD)**										
		(SC-SM) **CLAYEY SILTY SAND (FILL)** Gray/ brown mottled, moist, and medium dense	MC B7-1		7-12-16 (28)							
5		(CL) **SANDY CLAY (FILL):** Gray/ dark gray, moist, and hard	MC B7-2		9-14-18 (32)							
		becomes stiff	MC B7-3		5-5-6 (11)			19				
10		(CL) **SANDY CLAY (POSSIBLY FILL):** Gray, wet, stiff, and w/ traces of small gravels										
		Auger hit a hard layer and shift away a little bit										
15		(CL) **SANDY CLAY :** Yellowish brown, moist, very stiff, w/ iron stains	SPT B7-4		8-14-11 (25)							59
		becomes gray and hard	SPT B7-5		12-16-16 (32)							
20		▼										
25		(SP) **POORLY GRADED SAND:** Gray, wet, and very dense 50 blows for 5.5"	SPT B7-6		14-32-50 (82)							
		Bottom of borehole at 25.0 feet.										

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BORING NUMBER B-8

CLIENT South San Francisco Unified School District
PROJECT NAME Martin Elementary School
PROJECT NUMBER 91-02787-PW
PROJECT LOCATION 35 School St, South San Francisco, CA 94080
DATE STARTED 1/6/12 **COMPLETED** 1/6/12
GROUND ELEVATION 78 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Exploration Geoservices Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger 8"
AT TIME OF DRILLING ---
LOGGED BY RS **CHECKED BY**
AT END OF DRILLING 18.00 ft / Elev 60.00 ft Groundwater encountered
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		**4" ASPHALT**										
		4" AGGREGATE BASE										
		(SC) **CLAYEY SAND:** Olive/ gray, dry, and very dense	MC B8-1		27-46-46 (92)							
		(SM) **SILTY SAND (FILL):** Yellow/ brown, fairly dry, and very dense										
5		(SM) **SILTY SAND (FILL):** Yellowish brown, dry, and very dense	MC B8-2		11-22-35 (57)		108	9				
		(SC) **CLAYEY SAND (FILL):** Brown/ gray/ black mottled, very moist, and medium dense	MC B8-3		7-5-8 (13)		99	20				
10		(CH) **FAT CLAY (FILL):** Dark gray, very moist, and stiff										
		becomes gray/ brown mottled	MC B8-4		6-7-9 (16)		108	20				
15												
		(CL) **SANDY CLAY :** Gray/ brown mottled, very moist to wet, and stiff	MC B8-5		4-4-7 (11)				27	16	11	60
20												
		(CL) **SANDY CLAY (POSSIBLY FILL):** Gray, very moist to wet, stiff, and w/ green stains	MC B8-6		5-7-8 (15)							
25												

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BORING NUMBER B-8

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (psf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
		(CL) **SANDY CLAY (POSSIBLY FILL):** Gray, very moist to wet, stiff, and w/ green stains *(continued)*										
			MC B8-7		6-12-33 (45)							
30		(SC) **CLAYEY SAND:** Greenish gray, very moist to wet, dense, and w/ traces of gravels										
		becomes dark brown, moist, very dense, and w/ traces of gravel	MC B8-8		23-46-40 (86)							
35												
			SPT B8-9		17-32-40 (72)							
40												
45												
		(GP) **SANDY GRAVEL (WEATHERED ROCK FRAGMENTS):** Reddish brown, damp, and very dense 50 blows for second 6"	SPT B8-10		25-50							
50		Bottom of borehole at 50.0 feet.										

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APPENDIX B

LABORATORY TEST RESULTS

Atterberg Limits
Sieve Analysis
Direct Shear
Unconfined Compression Test
Corrosion
Summary Laboratory Results

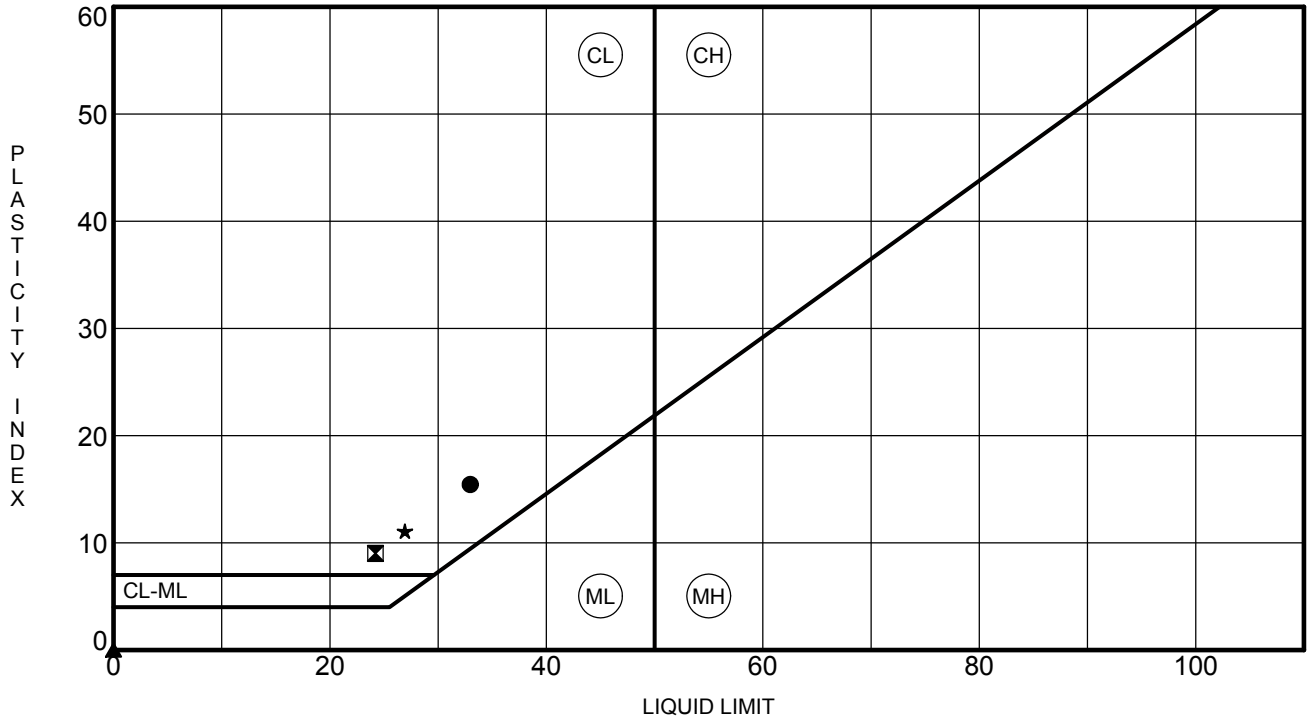
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ATTERBERG LIMITS' RESULTS

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**9.5**	**33**	**18**	**15**	**80**	**LEAN CLAY with SAND(CL)**
⊠	**B-2**	**14.5**	**24**	**15**	**9**	**52**	**SANDY LEAN CLAY(CL)**
▲	**B-5**	**18.5**	**NP**	**NP**	**NP**	**56**	**SANDY SILT(ML)**
★	**B-8**	**19.5**	**27**	**16**	**11**	**60**	**SANDY LEAN CLAY(CL)**

ATTERBERG LIMITS - CONSOLIDATED.GDT - 2/16/12 14:41 - R:\GEOTECH PROJECTS BY NUMBER\2700-2799\91-02787-PW MARTIN ES\MARTIN ES.GPJ

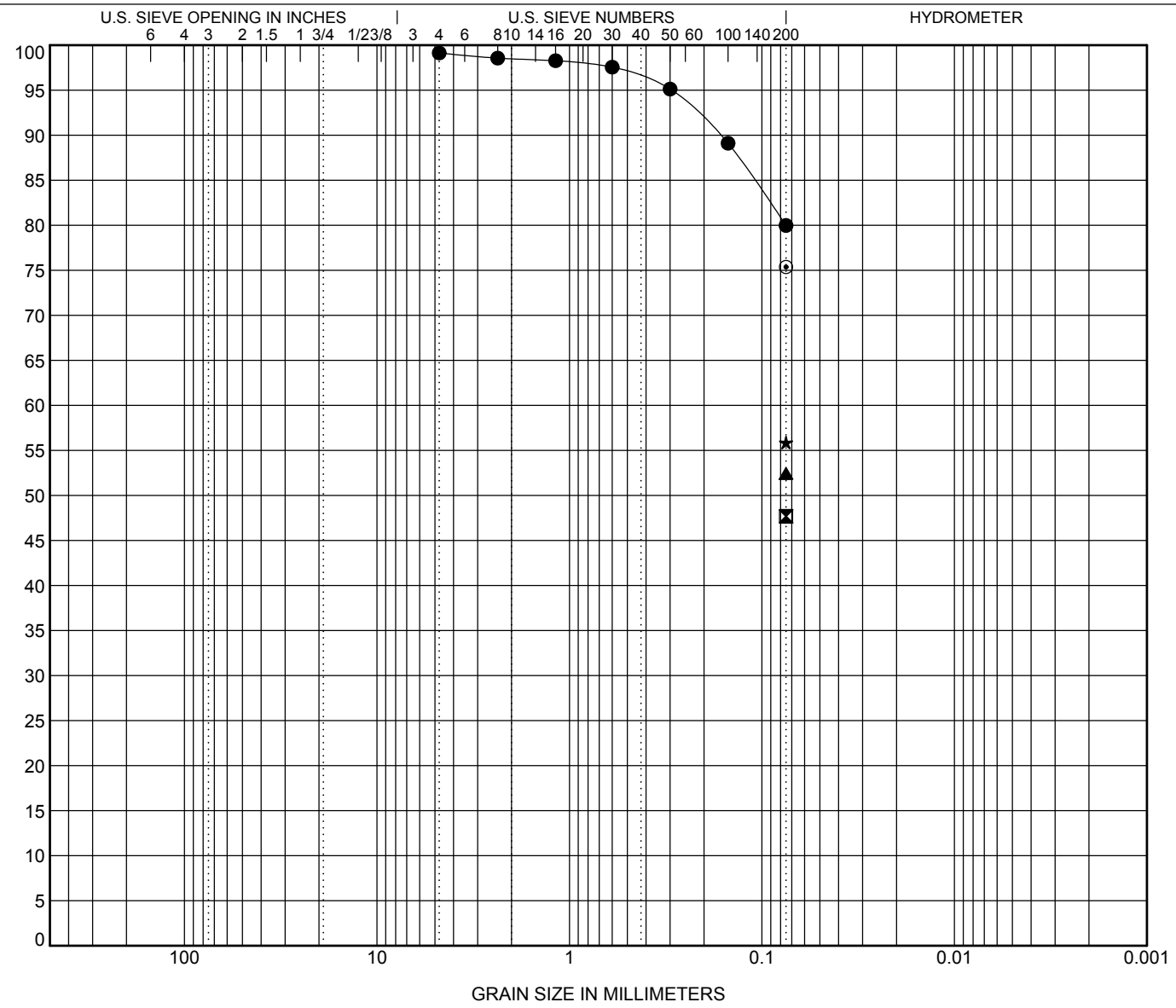
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GRAIN SIZE DISTRIBUTION

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080

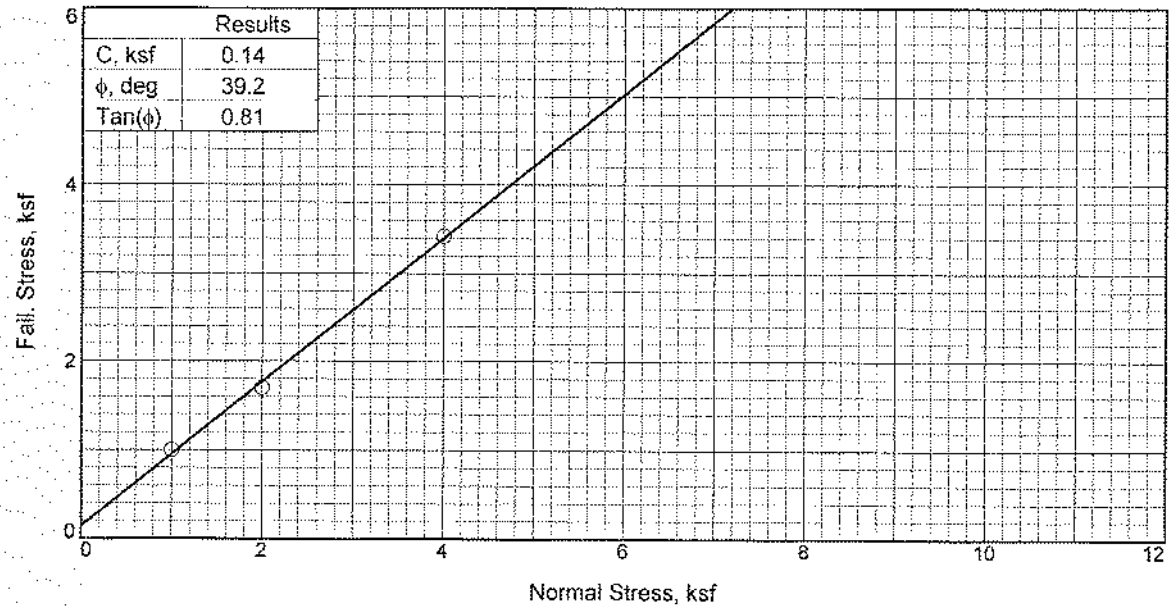


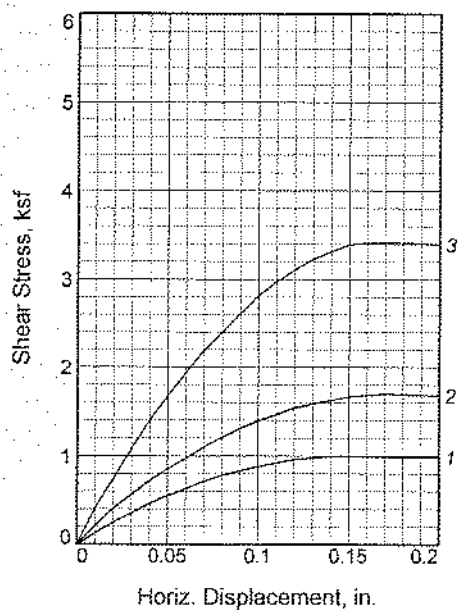
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	B-1	9.5	**LEAN CLAY with SAND(CL)**	**33**	**18**	**15**		
⊠	B-2	9.5						
▲	B-2	14.5	**SANDY LEAN CLAY(CL)**	**24**	**15**	**9**		
★	B-5	18.5	**SANDY SILT(ML)**	**NP**	**NP**	**NP**		
⊙	B-6	24.0						

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	9.5	**4.75**					**19.2**	**80.0**	
⊠	B-2	9.5	**0.075**						**47.7**	
▲	B-2	14.5	**0.075**						**52.4**	
★	B-5	18.5	**0.075**						**55.9**	
⊙	B-6	24.0	**0.075**						**75.4**	

GRAIN SIZE - CONSOLIDATED.GDT - 2/16/12 14:38 - R:\GEOTECH PROJECTS BY NUMBER\2700-2799\91-02787-PW MARTIN ES\MARTIN ES.GPJ





Sample No.		1	2	3
Initial	Water Content, %	14.3	14.3	14.3
	Dry Density, pcf	117.0	117.3	116.4
	Saturation, %	87.4	88.1	85.8
	Void Ratio	0.4404	0.4368	0.4485
	Diameter, in.	2.416	2.416	2.416
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	14.7	14.7	15.2
	Dry Density, pcf	117.1	117.5	116.5
	Saturation, %	90.3	91.0	91.7
	Void Ratio	0.4391	0.4351	0.4463
	Diameter, in.	2.416	2.416	2.416
	Height, in.	0.999	0.999	0.999
Normal Stress, ksf		1.00	2.00	4.00
Fail. Stress, ksf		1.00	1.70	3.42
Displacement, in.		0.150	0.170	0.170
Ult. Stress, ksf				
Displacement, in.				
Strain rate, in./min.		0.020	0.020	0.020

Sample Type: Mod.Cal.
Description: Very stiff to hard,grayish black lean CLAY(CL-CH)

Assumed Specific Gravity= 2.70
Remarks:

Figure _____

Client: Geosphere Consultants,Inc.

Project: Martin E.S.

Location: B-7
Depth: 4.5'
Proj. No.: 91-02787-PW **Date Sampled:**

DIRECT SHEAR TEST REPORT

Soil Mechanics Lab

Tested By: MA

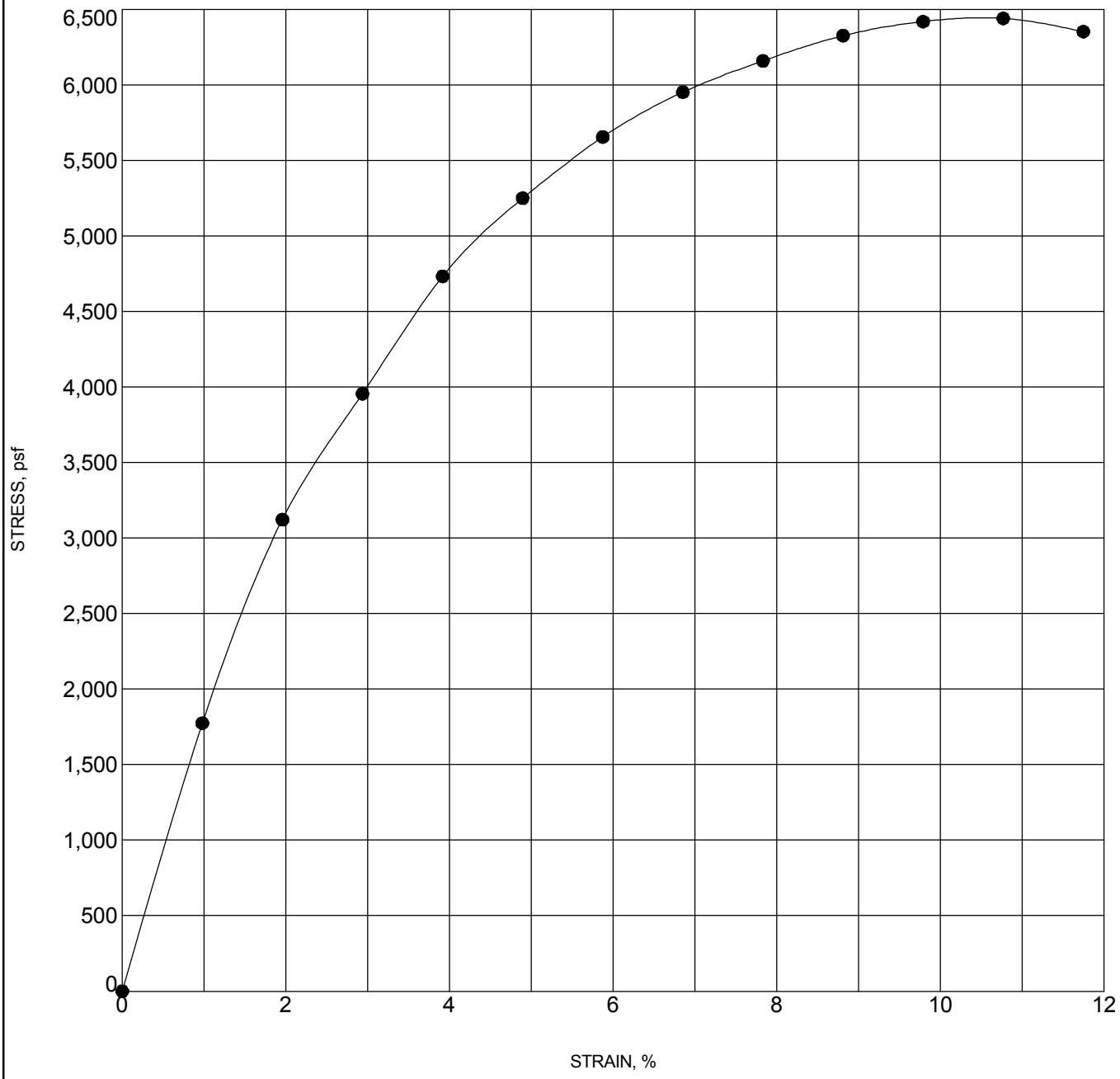
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2001 Crow Canyon Road Suite 100
San Ramon, CA 94583-5387
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Fax: 925 855-7140

UNCONFINED COMPRESSION TEST

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080



Specimen Identification		Classification	γ_d	MC%
● **B-1**	**4.5**	**LEAN CLAY (CL)**	**108**	**19**

Corrosivity Test Summary

CTL # 724-005 **Date:** 1/30/2012 **Tested By:** PJ **Checked:** PJ

Client: Geosphere Consultants **Project:** Martin ES **Proj. No:** 91-02787-PW

Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate-(water soluble)		pH	ORP	Sulfide	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	Qualitative	%	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	by Lead	At Test	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	ASTM G51	SM 2580B	Acetate Paper	ASTM D2216	
B-5	-	2-4	-	-	3,589	29	<5	<0.0005	6.4	334	Negative	20.0	Bluish Brown Clayey SAND

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San Ramon, CA 94583
Telephone: 925-314-7100
Fax: 925-855-7140

SUMMARY OF LABORATORY RESULTS

CLIENT South San Francisco Unified School District **PROJECT NAME** Martin Elementary School

PROJECT NUMBER 91-02787-PW **PROJECT LOCATION** 35 School St, South San Francisco, CA 94080

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	4.5							18.8	107.6		
B-1	9.5	33	18	15	4.75	80	CL	21.8	103.7		
B-1	24.0							24.1	100.8		
B-2	4.5							20.8	105.3		
B-2	9.5				0.075	48					
B-2	14.5	24	15	9	0.075	52	CL				
B-3	2.0							14.9	114.3		
B-4	9.5							17.2	113.5		
B-5	4.5							12.6	119.7		
B-5	18.5	NP	NP	NP	0.075	56	ML				
B-6	9.0							20.3	100.7		
B-6	24.0				0.075	75					
B-7	9.0							19.3			
B-7	16.0				0.075	59					
B-8	4.5							9.2	108.1		
B-8	9.0							20.4	99.2		
B-8	14.5							20.0	107.7		
B-8	19.5	27	16	11	0.075	60	CL				

LAB SUMMARY - CONSOLIDATED.GDT - 2/16/12 14:38 - R:\GEOTECH PROJECTS BY NUMBER\2700-2799\91-02787-PW MARTIN ES\MARTIN ES.GPJ

APPENDIX C

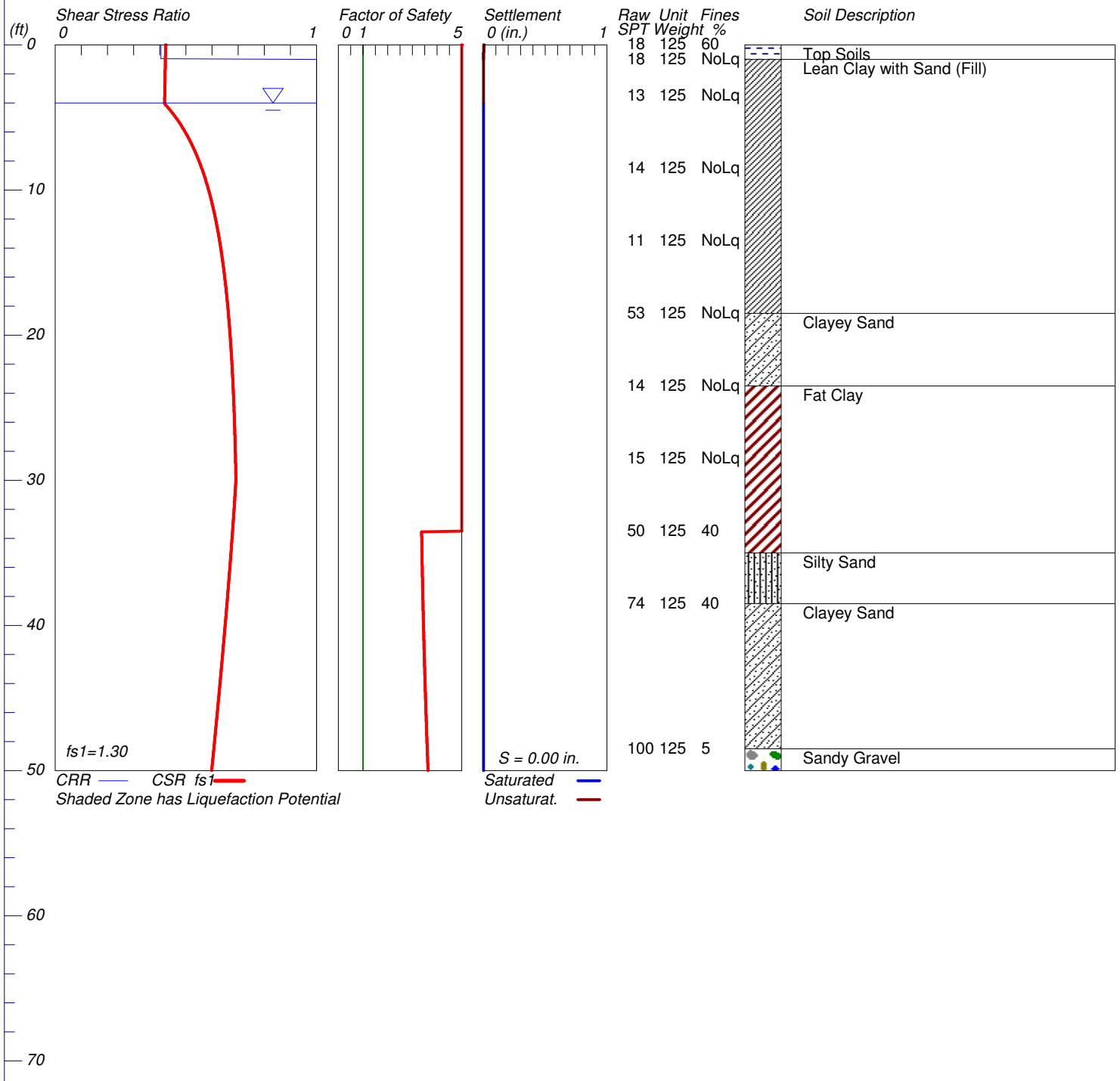
Liquefaction Analyses

LIQUEFACTION ANALYSIS

Martin ES

Hole No.=B-1 Water Depth=4 ft Surface Elev.=83

Magnitude=7.1
Acceleration=0.5g



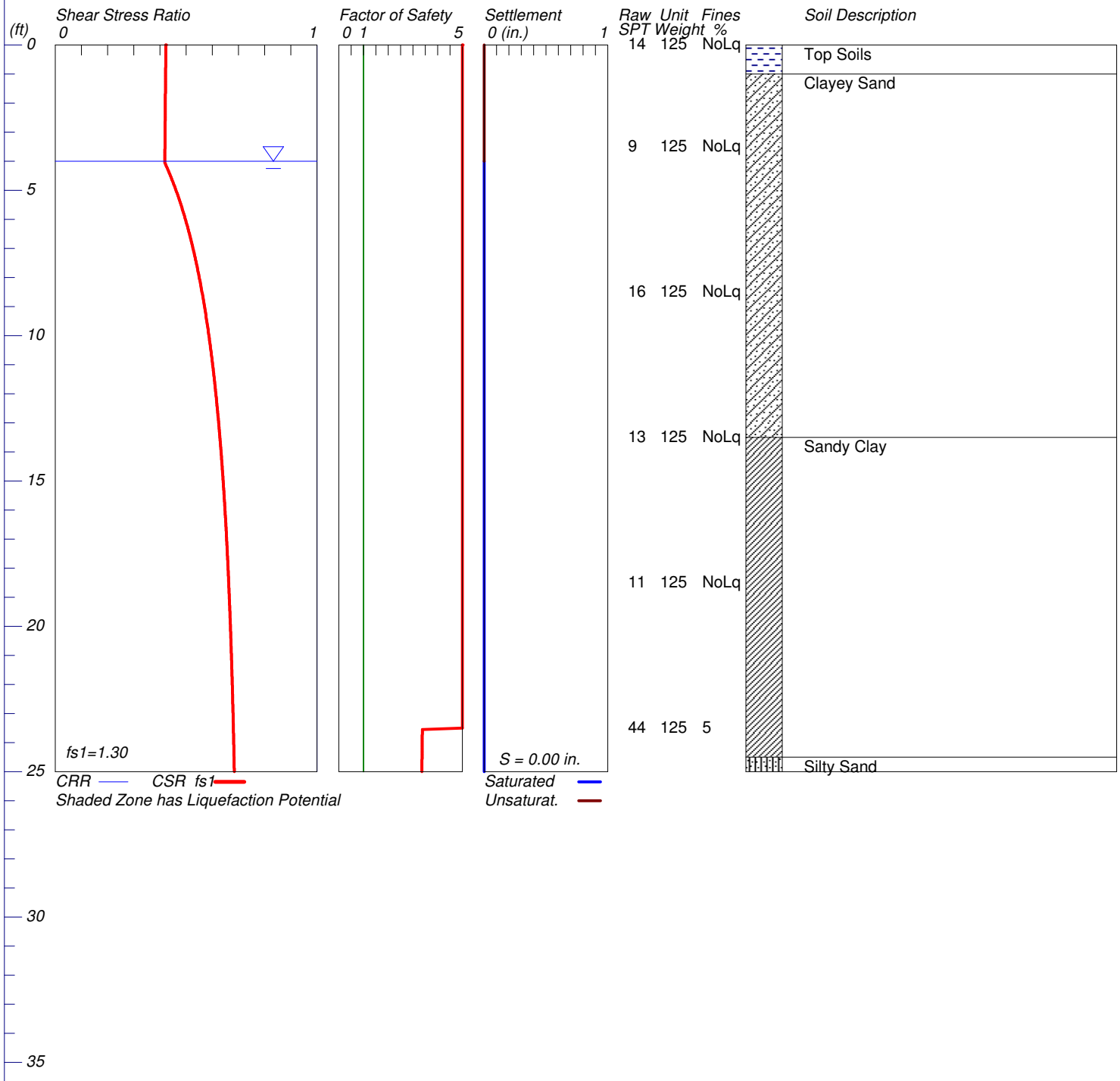
LiquefyPro CivilTech Software USA www.civiltech.com

LIQUEFACTION ANALYSIS

Martin ES

Hole No.=B-2 Water Depth=4 ft Surface Elev.=85

Magnitude=7.1
Acceleration=0.5g



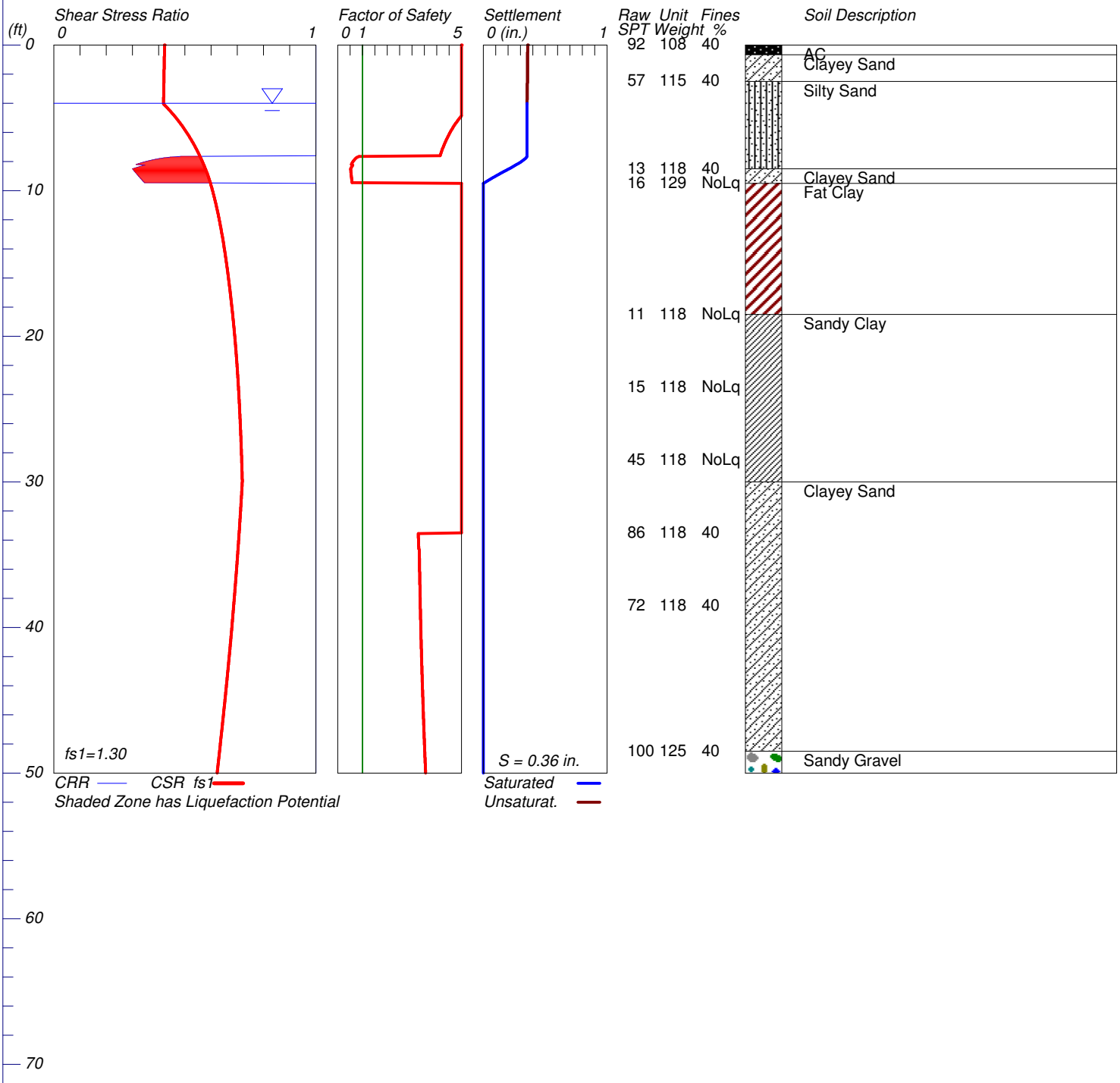
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LIQUEFACTION ANALYSIS

Martin ES

Hole No.=B-8 Water Depth=4 ft Surface Elev.=78

Magnitude=7.1
Acceleration=0.5g



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AN ETS COMPANY
Geotechnical Engineering · Engineering Geology
Environmental Management · Water Resources

May 11, 2012

South San Francisco Unified School District
Measure J Bond Program
398 B Street Facility Building
South San Francisco, California 94080



Attention: Mr. Bob Collins, Program Manager

Subject: **Analytical Sampling and Testing of Soil**
Alta Loma Middle School
Buri Buri Elementary School
Martin Elementary School
South San Francisco High School
South San Francisco, California
Geosphere Project No. 91-02807-A

Dear Mr. Collins:

Pursuant to your request, ***Geosphere Consultants, Inc.*** (Geosphere) has provided analytical sampling and testing services of on-site soil for the five subject sites. Our representative visited the site on April 28, 2012 and revisited select previous geotechnical boring locations at the subject properties in South San Francisco, California. There we collected composite soil samples generated from hand augering. ***Geosphere*** is not aware of any past environmental issues or concerns at the sites. ***Geosphere*** was not provided a Phase I ESA report for the sites. The battery of testing performed was done in accordance with our proposal dated February 14, 2012.

Our representative hand augered two locations at each site up to three feet in depth. The samples were composited on site. The soil samples were transported on ice to a California State-Certified laboratory for testing. Proper chain-of-custody procedures were followed. The composite samples were analyzed for the presence of CAM 17 Metals (EPA 6020), STLC extraction for lead, arsenic and chromium, TPH gasoline with BTEX and MTBE (EPA 8015), TPH diesel and motor oil (EPA 8015), and PCBs and Pesticides.

Alta Loma Middle School – Sample AL # 1 was sampled from landscaped areas adjacent to previous borings B1 and B2 in our Geotechnical Engineering Study dated February 16, 2012.

Buri Buri Elementary School – Sample BB # 1 was sampled from landscaped areas adjacent to previous borings B2 and B7 in our Geotechnical Engineering Study dated February 8, 2012.

Martin Elementary School – Sample M # 1 was sampled from landscaped areas adjacent to previous borings B2 and B8 in our Geotechnical Engineering Study dated February 24, 2012.

South San Francisco High School – Sample SSF # 1 was sampled from landscaped areas adjacent to previous borings B1 and B2 in our Geotechnical Engineering Study dated February 15, 2012.

It is our understanding that you do not require an opinion of the results or supplemental consulting including waste profiling and/or remediation consultation. Please note that our proposal also listed Parkway Heights Middle School as an additional site to sample, however, due to changes in construction scheduling we did not perform sampling and analysis at that school and overall fees will be reduced accordingly.

It is our pleasure to be of service to you. If you should have any questions regarding this letter or would like to request additional sampling or testing, please contact the undersigned at (925) 314-7180, ejs@geosphereinc.net. Other testing may require additional sampling depending on the quantity of sample remaining in the labs custody.

Sincerely,
GEOSPHERE CONSULTANTS, INC.

Roger J. Wilcox
Staff Engineer

Eric J. Swenson, CEG, GE
Principal Geotechnical Engineer

Distribution: 2 plus PDF to Addressee (rcollins@ssfusd.org)

Attachment: Chain of Custody (4 schools)
McCampbell Analytical Report (4 Schools)

RJW/EJS:pmf
R:\Geotech Projects by Number\2800-2899\91-02807-A South SF Anaylitcal - 5 School Sites\91-02807-A Analytical Testing Results.doc

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Analytical Report

Geosphere Consultants	Client Project ID: #91-02807-A; Buri Buri E.S.	Date Sampled: 04/28/12
2001 Crow Canyon Road, Suite 100		Date Received: 04/30/12
	Client Contact: Roger Wilcox	Date Reported: 05/04/12
San Ramon, CA 94583	Client P.O.: #GEO-000113	Date Completed: 05/04/12

WorkOrder: 1204867

May 07, 2012

Dear Roger:

Enclosed within are:

1) The results of the **1** analyzed sample from your project: **#91-02807-A; Buri Buri E.S.,**
2) QC data for the above sample, and
3) A copy of the chain of custody.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions or concerns, please feel free to give me a call. Thank you for choosing McCampbell Analytical Laboratories for your analytical needs.

Best regards,

Angela Rydelius
Laboratory Manager
McCampbell Analytical, Inc.

The analytical results relate only to the items tested.

P.O # GEO-000113 1204867

McCAMPBELL ANALYTICAL, INC.

1534 WILLOW PASS ROAD
PITTSBURG, CA 94565-1701
Website: www.mccampbell.com Email: main@mccampbell.com
Telephone: (877) 252-9262 Fax: (925) 252-9269

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HR ☐ 48 HR ☐ 72 HR ☒ 5 DAY

GeoTracker EDF ☐ PDF ☒ Excel ☐ Write On (DW) ☐

☐ Check if sample is effluent and "J" flag is required

Report To: Roger Wilcox	Bill To: A.P.
Company: Geosphere Consultants Inc.	
2001 Crow Canyon Road, Suite 100	
San Ramon, CA 94583	E-Mail: rjw@geosphereinc.net
Tele: (925) 314-7180	Fax: (925) 855-7140
Project #: 91-02807-A	Project Name: Burl Burl E-S
Project Location: 120, El Camino Dr. South San Francisco	
Sampler Signature:	

SAMPLE ID	LOCATION/ Field Point Name	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX: Water	Soil	Air	Sludge	Other	METHOD PRESERVED: ICE	HCL	HNO_3	Other	BTEX & TPH as Gas (602 / 8021 + 8015) / MTBE	TPH as Diesel (8015) + M.O.	Total Petroleum Oil & Grease (1664 / 5520 E/B&F)	Total Petroleum Hydrocarbons (418.1)	EPA 502.2 / 601 / 8010 / 8021 (HVOCs)	MTBE / BTEX ONLY (EPA 602 / 8021)	EPA 505 / 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ONLY; Aroclors / Congeners	EPA 507 / 8141 (NP Pesticides)	EPA 515 / 8151 (Acidic Cl Herbicides)	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.7 / 200.8 / 6010 / 6020)	LUFT 5 Metals (200.7 / 200.8 / 6010 / 6020)	Lead (200.7 / 200.8 / 6010 / 6020)	Other: Filter sample for DISSOLVED metals analysis	STLC for Arsenic, Lead, Chromium	Comments
BB #1	B2 : B7	4/29/12	7:30am	1	G1		X				X				XX						X						X					X		

**Indicate here if these samples are potentially dangerous to handle:

**MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and for allowing us to work safely.

Relinquished By:	Date:	Time:	Received By:
	4/30/12	10:40	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

ICE/t° 6.0 COMMENTS:
GOOD CONDITION
HEAD SPACE ABSENT
DECHLORINATED IN LAB
APPROPRIATE CONTAINERS
PRESERVED IN LAB

VOAS O&G METALS OTHER
PRESERVATION pH<2

McCampbell Analytical, Inc.
1534 Willow Pass Rd
Pittsburg, CA 94565-1701
(925) 252-9262

CHAIN-OF-CUSTODY RECORD

WorkOrder: 1204867 **ClientCode: GCSR**

☐ WaterTrax ☐ WriteOn ☐ EDF ☐ Excel ☐ Fax ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

Report to:
Roger Wilcox
Geosphere Consultants
2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
925-314-7180 FAX: 925-855-7140

Email: rjw@geosphereinc.net
cc:
PO: #GEO-000113
ProjectNo: #91-02807-A; Buri Buri E.S.

Bill to:
Jennifer Janeson
Geosphere Consultants
2001 Crow Canyon Road, Suite 100
San Ramon, CA 94583
accountspayable@ce-labs.com

Requested TAT: 5 days

Date Received: 04/30/2012
Date Printed: 04/30/2012

Lab ID	Client ID	Matrix	Collection Date	Hold	Requested Tests (See legend below) 1	2	3	4	5	6	7	8	9	10	11	12
1204867-001	BB#1	Soil	4/28/2012 7:30	☐	A	A	A	A	A							

Test Legend:

1	8081PCB_S	2	CAM17MS_S	3	G-MBTEX_S	4	STLCMETALMS_S	5	TPH(DMO)_S
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

NOTE: Soil samples are discarded 60 days after results are reported unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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Sample Receipt Checklist

Client Name:	**Geosphere Consultants**	Date and Time Received:	**4/30/2012 10:58:05 AM**
Project Name:	**#91-02807-A; Buri Buri E.S.**	LogIn Reviewed by:	Maria Venegas
WorkOrder N°:	**1204867** Matrix: Soil	Carrier:	Client Drop-In

Chain of Custody (COC) Information

Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Sample IDs noted by Client on COC?	Yes ☑	No ☐	
Date and Time of collection noted by Client on COC?	Yes ☑	No ☐	
Sampler's name noted on COC?	Yes ☑	No ☐	

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	NA ☑
Shipping container/cooler in good condition?	Yes ☑	No ☐	
Samples in proper containers/bottles?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature	Cooler Temp: 6°C		NA ☐
Water - VOA vials have zero headspace / no bubbles?	Yes ☐	No ☐	No VOA vials submitted ☑
Sample labels checked for correct preservation?	Yes ☑	No ☐	
Metal - pH acceptable upon receipt (pH<2)?	Yes ☐	No ☐	NA ☑
Samples Received on Ice?	Yes ☑	No ☐	

(Ice Type: BLUE ICE)

** NOTE: If the "No" box is checked, see comments below.*

Comments:

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Geosphere Consultants	Client Project ID: #91-02807-A; Buri Buri E.S.	Date Sampled: 04/28/12
		Date Received: 04/30/12
2001 Crow Canyon Road, Suite 100	Client Contact: Roger Wilcox	Date Extracted: 04/30/12
San Ramon, CA 94583	Client P.O.: #GEO-000113	Date Analyzed: 05/02/12

Organochlorine Pesticides (8080 Basic Target List) + PCBs

Extraction Method: SW3550B | Analytical Method: SW8081A/8082 | Work Order: 1204867

					Reporting Limit for DF =1	
Lab ID	1204867-001A					
Client ID	BB#1					
Matrix	S				S	W
DF	1					
Compound	**Concentration**				mg/kg	µg/L
Aldrin	ND				0.001	NA
a-BHC	ND				0.001	NA
b-BHC	ND				0.001	NA
d-BHC	ND				0.001	NA
g-BHC	ND				0.001	NA
Chlordane (Technical)	ND				0.025	NA
a-Chlordane	ND				0.001	NA
g-Chlordane	ND				0.001	NA
p,p-DDD	ND				0.001	NA
p,p-DDE	ND				0.001	NA
p,p-DDT	ND				0.001	NA
Dieldrin	ND				0.001	NA
Endosulfan I	ND				0.001	NA
Endosulfan II	ND				0.001	NA
Endosulfan sulfate	ND				0.001	NA
Endrin	ND				0.001	NA
Endrin aldehyde	ND				0.001	NA
Endrin ketone	ND				0.001	NA
Heptachlor	ND				0.001	NA
Heptachlor epoxide	ND				0.001	NA
Hexachlorobenzene	ND				0.01	NA
Hexachlorocyclopentadiene	ND				0.02	NA
Methoxychlor	ND				0.001	NA
Toxaphene	ND				0.05	NA
Aroclor1016	ND				0.05	NA
Aroclor1221	ND				0.05	NA
Aroclor1232	ND				0.05	NA
Aroclor1242	ND				0.05	NA
Aroclor1248	ND				0.05	NA
Aroclor1254	ND				0.05	NA
Aroclor1260	ND				0.05	NA
PCBs, total	ND				0.05	NA
Surrogate Recoveries (%)						
%SS:	93					
Comments						

* soil/sludge/solid samples in mg/kg.

ND means not detected above the reporting limit/method detection limit; N/A means analyte not applicable to this analysis; %SS = Percent Recovery of Surrogate Standard; DF = Dilution Factor.

surrogate diluted out of range or surrogate coelutes with another peak

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Geosphere Consultants	Client Project ID: #91-02807-A; Buri Buri E.S.	Date Sampled: 04/28/12
		Date Received 04/30/12
2001 Crow Canyon Road, Suite 100	Client Contact: Roger Wilcox	Date Extracted 04/30/12
San Ramon, CA 94583	Client P.O.: #GEO-000113	Date Analyzed 05/01/12

CAM / CCR 17 Metals*

					Reporting Limit for DF =1; ND means not detected above the reporting limit	
Lab ID	1204867-001A					
Client ID	BB#1					
Matrix	S				S	W
Extraction Type	TOTAL				mg/Kg	mg/L

ICP Metals, Concentration*

Analytical Method: SW6020 Extraction Method: SW3050B Work Order: 1204867

Dilution Factor	1				1	1
Antimony	ND				0.5	NA
Arsenic	2.4				0.5	NA
Barium	96				5.0	NA
Beryllium	ND				0.5	NA
Cadmium	ND				0.25	NA
Chromium	42				0.5	NA
Cobalt	5.8				0.5	NA
Copper	11				0.5	NA
Lead	7.7				0.5	NA
Mercury	ND				0.05	NA
Molybdenum	ND				0.5	NA
Nickel	19				0.5	NA
Selenium	ND				0.5	NA
Silver	ND				0.5	NA
Thallium	ND				0.5	NA
Vanadium	33				0.5	NA
Zinc	28				5.0	NA
%SS:	118					

Comments

*water samples are reported in µg/L, product/oil/non-aqueous liquid samples and all TCLP / STLC / DISTLC / SPLP extracts are reported in mg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, filter samples in µg/filter.

means surrogate diluted out of range; ND means not detected above the reporting limit/method detection limit; N/A means not applicable to this sample or instrument.

TOTAL = Hot acid digestion of a representative sample aliquot.
TRM = Total recoverable metals is the "direct analysis" of a sample aliquot taken from its acid-preserved container.
DISS = Dissolved metals by direct analysis of 0.45 µm filtered and acidified sample.
%SS = Percent Recovery of Surrogate Standard
DF = Dilution Factor

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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Geosphere Consultants	Client Project ID: #91-02807-A; Buri Buri E.S.	Date Sampled: 04/28/12
		Date Received: 04/30/12
2001 Crow Canyon Road, Suite 100	Client Contact: Roger Wilcox	Date Extracted: 04/30/12
San Ramon, CA 94583	Client P.O.: #GEO-000113	Date Analyzed: 05/02/12

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Extraction method: SW5030B Analytical methods: SW8021B/8015Bm Work Order: 1204867

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS	Comments
001A	BB#1	S	ND	ND	ND	ND	ND	ND	1	116	

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	50	5.0	0.5	0.5	0.5	0.5	ug/L
	S	1.0	0.05	0.005	0.005	0.005	0.005	mg/Kg

* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples and all TCLP & SPLP extracts in mg/L.

cluttered chromatogram; sample peak coelutes w/surrogate peak; low surrogate recovery due to matrix interference; %SS = Percent Recovery of Surrogate Standard; DF = Dilution Factor

The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:

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Angela Rydelius, Lab Manager

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Geosphere Consultants	Client Project ID: #91-02807-A; Buri Buri E.S.	Date Sampled: 04/28/12
		Date Received: 04/30/12
2001 Crow Canyon Road, Suite 100	Client Contact: Roger Wilcox	Date Extracted: 04/30/12-05/02/12
San Ramon, CA 94583	Client P.O.: #GEO-000113	Date Analyzed: 05/03/12-05/04/12

Metals*

Extraction method: CA Title 22 Analytical methods: SW6020 Work Order: 1204867

Lab ID	Client ID	Matrix	Extraction Type	Arsenic	Chromium	Lead	DF	% SS	Comments
001A	BB#1	S	WET	ND	ND	0.12	1	N/A	

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	TOTAL	NA	NA	NA	NA	
	S	WET	0.1	0.1	0.1	mg/L	

*water samples are reported in µg/L, product/oil/non-aqueous liquid samples and all TCLP / STLC / DISTLC / SPLP extracts are reported in mg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, filter samples in µg/filter.

means surrogate diluted out of range; ND means not detected above the reporting limit/method detection limit; N/A means not applicable to this sample or instrument.

WET = Waste Extraction Test, i.e., STLC (Soluble Threshold Limit Concentration).
DI WET = Waste Extraction Test using DI water (DI STLC).

%SS = Percent Recovery of Surrogate Standard
DF = Dilution Factor

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Angela Rydelius, Lab Manager

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Geosphere Consultants	Client Project ID: #91-02807-A; Buri Buri E.S.	Date Sampled: 04/28/12
		Date Received: 04/30/12
2001 Crow Canyon Road, Suite 100	Client Contact: Roger Wilcox	Date Extracted: 04/30/12
San Ramon, CA 94583	Client P.O.: #GEO-000113	Date Analyzed: 05/01/12

Total Extractable Petroleum Hydrocarbons*

Extraction method: SW3550B Analytical methods: SW8015B Work Order: 1204867

Lab ID	Client ID	Matrix	TPH-Diesel (C10-C23)	TPH-Motor Oil (C18-C36)	DF	% SS	Comments
1204867-001A	BB#1	S	1.6	7.1	1	98	e7,e2

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	NA	NA	ug/L
	S	1.0	5.0	mg/Kg

* water samples are reported in µg/L, wipe samples in µg/wipe, soil/solid/sludge samples in mg/kg, product/oil/non-aqueous liquid samples in mg/L, and all DISTLC / STLC / SPLP / TCLP extracts are reported in µg/L.

cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract; %SS = Percent Recovery of Surrogate Standard; DF = Dilution Factor

The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation:
e2) diesel range compounds are significant; no recognizable pattern
e7) oil range compounds are significant

DHS ELAP Certification 1644

Angela Rydelius, Lab Manager

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QC SUMMARY REPORT FOR SW8081A/8082

W.O. Sample Matrix: Soil | QC Matrix: Soil | BatchID: 67100 | WorkOrder: 1204867

EPA Method: SW8081A/8082 **Extraction: SW3550B** **Spiked Sample ID: 1204835-011A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	Acceptance Criteria (%)		
	mg/kg	mg/kg	% Rec.	% Rec.	% RPD	% Rec.	MS / MSD	RPD	LCS
Aldrin	ND	0.020	78.5	78.3	0.306	73.2	70 - 130	30	70 - 130
g-BHC	ND	0.020	76.8	76.3	0.659	80.3	70 - 130	30	70 - 130
p,p-DDT	ND	0.050	76.9	75.6	1.70	86.3	70 - 130	30	70 - 130
Dieldrin	ND	0.050	101	101	0	91.6	70 - 130	30	70 - 130
Endrin	ND	0.050	101	100	0.487	90.4	70 - 130	30	70 - 130
Heptachlor	ND	0.020	91.3	90.6	0.822	79	70 - 130	30	70 - 130
%SS:	101	0.050	104	102	2.30	94	70 - 130	30	70 - 130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 67100 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1204867-001A	04/28/12 7:30 AM	04/30/12	05/02/12 7:52 AM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
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http://www.mccampbell.com / E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW6020

W.O. Sample Matrix: Soil | QC Matrix: Soil | BatchID: 67108 | WorkOrder: 1204867

EPA Method: SW6020 **Extraction: SW3050B** **Spiked Sample ID: 1204840-025A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	Acceptance Criteria (%)		
	mg/Kg	mg/Kg	% Rec.	% Rec.	% RPD	% Rec.	MS / MSD	RPD	LCS
Antimony	ND	50	108	117	7.82	110	75 - 125	20	75 - 125
Arsenic	3.7	50	106	115	8.15	110	75 - 125	20	75 - 125
Barium	27	500	107	116	7.64	107	75 - 125	20	75 - 125
Beryllium	ND	50	98.4	106	7.91	104	75 - 125	20	75 - 125
Cadmium	ND	50	105	114	8.01	108	75 - 125	20	75 - 125
Chromium	61	50	101	119	7.75	107	75 - 125	20	75 - 125
Cobalt	6.2	50	108	116	6.78	114	75 - 125	20	75 - 125
Copper	4.8	50	108	119	8.89	111	75 - 125	20	75 - 125
Lead	4.8	50	108	118	8.63	110	75 - 125	20	75 - 125
Mercury	ND	1.25	112	121	8.20	113	75 - 125	20	75 - 125
Molybdenum	ND	50	108	118	9.45	110	75 - 125	20	75 - 125
Nickel	28	50	108	121	7.48	111	75 - 125	20	75 - 125
Selenium	ND	50	110	119	8.17	110	75 - 125	20	75 - 125
Silver	ND	50	103	111	7.69	105	75 - 125	20	75 - 125
Thallium	ND	50	98.7	108	9.06	100	75 - 125	20	75 - 125
Vanadium	59	50	101	119	7.88	108	75 - 125	20	75 - 125
Zinc	24	500	107	118	9.03	110	75 - 125	20	75 - 125
%SS:	117	500	111	119	6.47	110	70 - 130	20	70 - 130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 67108 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1204867-001A	04/28/12 7:30 AM	04/30/12	05/01/12 3:34 PM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not applicable to this method.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

McCampbell Analytical, Inc.
"When Quality Counts"
1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW6020

W.O. Sample Matrix: Soil | QC Matrix: Soil | BatchID: 67129 | WorkOrder: 1204867

EPA Method: SW6020 **Extraction: CA Title 22** **Spiked Sample ID: N/A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	Acceptance Criteria (%)		
	mg/L	mg/L	% Rec.	% Rec.	% RPD	% Rec.	MS / MSD	RPD	LCS
Arsenic	N/A	10	N/A	N/A	N/A	108	N/A	N/A	75 - 125
Chromium	N/A	10	N/A	N/A	N/A	100	N/A	N/A	75 - 125
Lead	N/A	10	N/A	N/A	N/A	99.5	N/A	N/A	75 - 125

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 67129 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1204867-001A	04/28/12 7:30 AM	04/30/12	05/03/12 8:14 PM	1204867-001A	04/28/12 7:30 AM	04/30/12	05/04/12 2:37 PM

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not applicable to this method.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

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QC SUMMARY REPORT FOR SW8015B

W.O. Sample Matrix: Soil | QC Matrix: Soil | BatchID: 67094 | WorkOrder: 1204867

EPA Method: SW8015B **Extraction: SW3550B** **Spiked Sample ID: 1204840-031A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	Acceptance Criteria (%)		
	mg/Kg	mg/Kg	% Rec.	% Rec.	% RPD	% Rec.	MS / MSD	RPD	LCS
TPH-Diesel (C10-C23)	2.2	40	99.9	97.6	2.19	99.6	70 - 130	30	70 - 130
%SS:	88	25	90	87	2.64	86	70 - 130	30	70 - 130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 67094 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1204867-001A	04/28/12 7:30 AM	04/30/12	05/01/12 10:35 PM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

McCampbell Analytical, Inc.
"When Quality Counts"

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http://www.mccampbell.com / E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW8021B/8015Bm

W.O. Sample Matrix: Soil | QC Matrix: Soil | BatchID: 67110 | WorkOrder: 1204867

EPA Method: SW8021B/8015Bm **Extraction: SW5030B** **Spiked Sample ID: 1204840-031A**

Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	Acceptance Criteria (%)		
	mg/Kg	mg/Kg	% Rec.	% Rec.	% RPD	% Rec.	MS / MSD	RPD	LCS
TPH(btex)£	ND	0.60	91.7	88.7	3.31	88.9	70 - 130	20	70 - 130
MTBE	ND	0.10	92.8	82.5	11.7	81	70 - 130	20	70 - 130
Benzene	ND	0.10	89.3	83.7	6.45	85.4	70 - 130	20	70 - 130
Toluene	ND	0.10	88	82.7	6.27	84.1	70 - 130	20	70 - 130
Ethylbenzene	ND	0.10	91	84.6	7.24	86.6	70 - 130	20	70 - 130
Xylenes	ND	0.30	94.5	87.2	8.06	89.6	70 - 130	20	70 - 130
%SS:	108	0.10	83	83	0	85	70 - 130	20	70 - 130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:
NONE

BATCH 67110 SUMMARY

Lab ID	Date Sampled	Date Extracted	Date Analyzed	Lab ID	Date Sampled	Date Extracted	Date Analyzed
1204867-001A	04/28/12 7:30 AM	04/30/12	05/02/12 5:27 AM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

£ TPH(btex) = sum of BTEX areas from the FID.

cluttered chromatogram; sample peak coelutes with surrogate peak.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = matrix interference and/or analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

DHS ELAP Certification 1644

QA/QC Officer

DOCUMENT 00 43 13

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 South San Francisco Unified School District ("District") of San Mateo 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 duty 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

DOCUMENT 00 43 36

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

PROJECT 01-19: Martin Elementary School Modernization

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: _____

Subcontractor Name: _____

CA Cont. Lic. #: _____ Location: _____

Portion of Work: _____

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 45 01

SITE VISIT CERTIFICATION

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

PROJECT 01-19: Martin Elementary School Modernization

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 South San Francisco 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

DOCUMENT 00 45 19

NON-COLLUSION DECLARATION
(Public Contract Code Section 7106)

The undersigned declares:

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

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

DOCUMENT 00 45 19.01

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

PROJECT/CONTRACT NO. 01-19: Martin Elementary School Modernization, between the South San Francisco 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.

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

END OF DOCUMENT

DOCUMENT 00 45 26

WORKERS' COMPENSATION CERTIFICATION

PROJECT/CONTRACT NO. 01-19: Martin Elementary School Modernization, ____ _____ between the South San Francisco 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

DOCUMENT 00 45 46.01

PREVAILING WAGE AND RELATED LABOR REQUIREMENTS CERTIFICATION

Martin Elementary School Modernization, Project No. 01-19 between the South San Francisco Unified School District ("District") and _____ ("Contractor" or "Bidder") ("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.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 45 46.03

DRUG-FREE WORKPLACE CERTIFICATION

PROJECT NO. 01-19: Martin Elementary School Modernization, between the South San Francisco Unified School District ("District") and _____ _____ ("Contractor" or "Bidder") ("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

DOCUMENT 00 45 46.04

TOBACCO-FREE ENVIRONMENT CERTIFICATION

PROJECT NO. 01-19 Martin Elementary School Modernization between the South San Francisco 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., 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

DOCUMENT 00 45 46.05

HAZARDOUS MATERIALS CERTIFICATION

PROJECT NO. 01-19: Martin Elementary School Modernization, between South San Francisco Unified School District ("District") and _____ ("Contractor" or "Bidder") ("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

DOCUMENT 00 45 46.06

LEAD-BASED MATERIALS CERTIFICATION

PROJECT NO. 01-19: Martin Elementary School Modernization, between the South San Francisco Unified School District ("District") and _____ ("Contractor" or "Bidder") ("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 disburses 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

DOCUMENT 00 45 46.07

IMPORTED MATERIALS CERTIFICATION

PROJECT NO. 01-19: Martin Elementary School Modernization, between the South San Francisco 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

DOCUMENT 00 45 46.08

CRIMINAL BACKGROUND INVESTIGATION /FINGERPRINTING CERTIFICATION

PROJECT NO. 01-19: Martin Elementary School Modernization, between the South San Francisco Unified School District ("District") and _____ ("Contractor" or "Bidder") ("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: _____

DOCUMENT 00 45 49

REGISTERED SUBCONTRACTORS LIST
(Labor Code Section 1771.1)

PROJECT: **Martin Elementary School Modernization, Project No. 01-19**

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: _____

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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

DOCUMENT 00 51 00

NOTICE OF AWARD

Dated: _____ 20__

To: _____ (Contractor)

To: _____
(Address)

From: Governing Board ("Board") of the South San Francisco Unified School District ("District")

Re: **Martin Elementary School Modernization, Project No. 01-19** ("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. Drug-Free Workplace Certification.

i. Tobacco-Free Environment Certification.

j. Hazardous Materials Certification.

k. Lead-Based Materials Certification.

l. Imported Materials Certification.

m. Criminal Background Investigation/Fingerprinting 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.

SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

DOCUMENT 00 52 13

AGREEMENT

THIS AGREEMENT IS MADE AND ENTERED INTO THIS _____ DAY OF _____ _____, 20___, by and between the South San Francisco 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:

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:

Martin Elementary School Modernization ("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.

1. **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.

2. **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.

3. **Time for Completion**: It is hereby understood and agreed that the Work under this Contract shall be completed within ONE HUNDRED EIGHTY DAYS (180) consecutive calendar days ("Contract Time") from the date specified in the District's Notice to Proceed.

4. **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.

5. **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 TWO THOUSAND DOLLARS ($2,000.00) 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.

6. **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.

7. **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.

8. **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.

9. **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.

10. **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.

11. **Classification of Contractor's License**: Contractor hereby acknowledges that it currently holds valid Type _____ 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.

12. **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.

13. **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.

14. 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.

15. **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).

16. 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.

17. 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.

18. 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	**SOUTH SAN FRANCISCO 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

DOCUMENT 00 55 00

NOTICE TO PROCEED

Dated: _____, 20___

TO: _____
("Contractor")

ADDRESS: _____

PROJECT:_____

PROJECT NO. 01-19: Martin Elementary School Modernization between the South San Francisco 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 _____, 20___.

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.

SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

DOCUMENT 00 57 00

ESCROW AGREEMENT IN LIEU OF RETENTION
(Public Contact 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 South San Francisco Unified School District ("District"), whose address is 398 B Street, South San Francisco, California 94080 , 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 South San Francisco 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 $_____ 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:	On behalf of Contractor:
Title	Title
Name	Name
Signature	Signature
Address	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:	On behalf of Contractor:
Title	Title
Name	Name
Signature	Signature
Address	Address

END OF DOCUMENT

DOCUMENT 00 61 13.13

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 South San Francisco 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:

Martin Elementary School Modernization, Project No. 01-19

("Project") 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 warrantees 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

DOCUMENT 00 61 13.16

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 South San Francisco 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:

Martin Elementary School Modernization, Project No. 01-19

("Project") 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

DOCUMENT 00 63 57

PROPOSED CHANGE ORDER FORM

South San Francisco Unified School District
398 B Street
South San Francisco, CA 94080

PCO NO.:

Project: Martin Elementary School Modernization, Project No. 01-19
RFI #:_____

Date: _____
DSA File No.: 04-28
DSA Appl. No.:01-116977

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.

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

[REMAINDER OF PAGE LEFT BLANK INTENTIONALLY]

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

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

DOCUMENT 00 63 63

CHANGE ORDER FORM

South San Francisco Unified School District
398 B Street
South San Francisco, CA 94080

CHANGE ORDER NO.:

CHANGE ORDER

Project No. 01-19: Martin Elementary School Modernization

Date: _____
DSA File No.: 04-28
DSA Appl. No.: 01-116977

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: Previous Completion Date: [Date] _____[#] Calendar Days Extension (zero unless otherwise indicated) Current Completion Date: [Date]	Original Contract Amount:	$
	Amount of Previously Approved Change Order(s):	$
	Amount of this Change Order:	$
	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

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

DOCUMENT 00 65 19.26

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 SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT ("District") and _____ _____ ("Contractor"), whose place of business is _____ _____.

RECITALS

WHEREAS, District and Contractor entered into **Martin Elementary School Modernization, Project No. 01-19** ("Project") in the County of San Mateo, 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:

Claim No.	Description of Claim	Amount of Claim	Date Claim Submitted
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____
_____	_____	$_____	_____

[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 WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.

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 * * *

SOUTH SAN FRANCISCO UNIFIED SCHOOL DISTRICT

Signature: _____

Print Name: _____

Title: _____

CONTRACTOR: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 65 36

GUARANTEE FORM

_____ ("Contractor") hereby agrees that the _____ _____ ("Work" of Contractor) which Contractor has installed for the South San Francisco Unified School District ("District") for the following project:

Project No. 01-19: Martin Elementary School Modernization

("Project") 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 one year 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
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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)
1.1.12.25 Lead-Based Materials Certification (if applicable)
1.1.12.26 Imported Materials Certification (if applicable)
1.1.12.27 Criminal Background Investigation/Fingerprinting Certification
1.1.12.28 Buy American Certification (if applicable)
1.1.12.29 Roofing Project Certification (if applicable)
1.1.12.30 Registered Subcontractors List
1.1.12.31 Iran Contracting Act Certification (if applicable)
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=displayPWCRegistrationForm 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

13.1.5.1 The District shall obtain and maintain in force during the term of this Agreement, a Builders' Risk Insurance policy or policies separate from the OCIP, which shall insure against all risks of physical loss and/ or damage, including flood but excluding earth movement, subject to normal policy exclusions, to all buildings, structures, materials, and real property on site, which are intended to be, or have already been incorporated into and forming part of the Project, whether or not such buildings, structures, materials, or real property will have been supplied or made available to Contractors by District.

13.1.5.2 The Builders' Risk policy shall be endorsed to add Contractors of any tier as additional named insureds' and to waive the carrier's right of recovery under subrogation against the District and all other Contractors of any tier whose interests are insured under such policy.

13.1.5.3 Unless required otherwise by District, claims under Builders' Risk insurance provided are subject to a Contractor Claims Obligation of fifteen thousand dollars ($15,000) per occurrence. If a claim results from any construction activity, the responsible Contractor, Subcontractor, or Sub-Subcontractor shall pay the Contractor Claims Obligation up to $15,000. All Builders' Risk losses will be adjusted with and payable to the District or its designee for the benefit of all parties as their interest may appear.

13.1.5.4 The District shall not be responsible for loss or damage to, or obtaining and/or maintaining in force insurance on temporary structures, construction equipment, tool or personal effects, owned or rented to or in the care, custody, and control of a Contractor of any tier.

13.1.5.5 In the event of loss or damage to the Project not covered by the Builders' Risk policy, the cost of the repair and/or replacement of such loss or damage shall be the responsibility of the District.

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:

Commercial General Liability	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	$5,000,000 per occurrence; $10,000,000 aggregate
Automobile Liability – Any Auto	Combined Single Limit	Personal vehicles $100,000 per person/ $300,000 per accident
Workers' Compensation		Statutory limits pursuant to State law
Employers' Liability		$1,000,000
Builder's Risk (Course of Construction)		Issued for $15,000.
Pollution Liability		$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.

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

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

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 <u>Prerequisites for Progress Payments</u>

19.2.2.1 <u>First Payment Request</u>: 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 <u>Subcontractor Pass-Through Claims</u>

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. [RESERVED]

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 (commending 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

DOCUMENT 00 73 13

SPECIAL CONDITIONS

1. Modernization Projects

1.1 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.

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

2. 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.

2.1 Badges must be filled out in full and contain the following information:

2.1.1 Name of Contractor

2.1.2 Name of Employee

2.1.3 Contractor's address and phone number

2.2 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.

2.3 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.

3. Substitution for Specified Items

3.1 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.

3.1.1 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.

3.1.2 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.

3.2 A request for a substitution shall be submitted as follows:

3.2.1 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.

3.2.2 Requests for Substitutions after award of the Contract shall be submitted within thirty-five (35) days of the date of the Notice of Award.

3.3 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:

3.3.1 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;

3.3.2 Available maintenance, repair or replacement services;

3.3.3 Increases or decreases in operating, maintenance, repair, replacement, and spare parts costs;

3.3.4 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

3.3.5 The time impact on any part of the Work resulting directly or indirectly from acceptance of the proposed substitute.

3.4 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:

3.4.1 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;

3.4.2 The Contractor provides the same warranties and guarantees for the substitute that would be provided for that specified;

3.4.3 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;

3.4.4 The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute; and

3.4.5 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.

3.5 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.

3.6 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.

3.7 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.

4. 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	**7**	July	**0**
February	**2**	August	**0**
March	**9**	September	**0**
April	**5**	October	**1**
May	**0**	November	**5**
June	**0**	December	**6**

5. Insurance Policy Limits

All of Contractor's insurance shall be with insurance companies with an A.M. Best rating of no less than A. The limits of insurance shall not be less than:

Commercial General Liability	Product Liability and Completed Operations, Fire Damage Liability – Split Limit	$5,000,000 per occurrence; $10,000,000 aggregate
Automobile Liability – Any Auto	Combined Single Limit	Personal vehicles $100,000 per person/ $300,000 per accident
Workers' Compensation		Statutory limits pursuant to State law
Employers' Liability		$1,000,000
Builder's Risk (Course of Construction)		Issued for $15,000.
Pollution Liability		$1,000,000 per claim; $2,000,000 aggregate

6. Permits, Certificates, Licenses, Fees, Approvals

6.1 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.

6.1.1 Water and sewer connection fees

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.

6.2 General Permit For Storm Water Discharges Associated With Construction and Land Disturbance Activities

6.2.1 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:

6.2.1.1 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.

6.2.1.2 Storm Water Pollution Prevention Plan ("SWPPP") contains specific best management practices ("BMPs") and establishes numeric effluent limitations at:

6.2.1.2.1 Sites where the District engages in maintenance (e.g., fueling, cleaning, repairing) for transportation activities.

6.2.1.2.2 Construction sites where:

6.2.1.2.2.1 One (1) or more acres of soil will be disturbed, or

6.2.1.2.2.2 The project is part of a larger common plan of development that disturbs more than one (1) acre of soil.

6.2.2 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.

6.2.3 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:

6.2.3.1 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

6.2.3.2 Monitoring any Numeric Action Levels (NALs), if applicable.

7. As-Builts and Record Drawings

7.1 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 plus one set of As-Built Drawings.

7.2 Contractor shall submit Record Drawings pursuant to the Contract Documents consisting of one set of computer-aided design and drafting ("CADD") files plus one set of Record Drawings .

8. 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.

9. Construction Manager

The District will use a Construction Manager (to be determined)on the Project that is the subject of this Contract.

10. Program Manager

Ron Vose, Director of Facilities**,** is the Program Manager designated for the Project that is the subject of this Contract.

11. 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:

11.1.1.2.3. The preliminary schedule of values shall not provide for values any greater than the following percentages of the Contract value:

11.1.2.3.1 Mobilization and layout combined to equal not more than **[1]**%;

11.1.1.2.3.2 Submittals, samples and shop drawings combined to equal not more than **[3]**%;

11.1.1.2.3.3 Bonds and insurance combined to equal not more than **[2]**%.

END OF DOCUMENT

DOCUMENT 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access Conditions and Requirements;

B. Special Conditions.

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract consists of the following:

Project will include phasing and consists of: site work- installation of kinder play structure and associated path of travel improvements; accessible gates; installation of vehicular gate; landscape improvements; addition of accessible bottle filling stations; Building remodel/upgrade- barrier removal; accessible stairs and ramp; window replacement; kinder and staff restrooms upgrades; furnace replacement; exterior painting.

1.03 CONTRACTS

A. Perform the Work under a single, fixed-price Contract.

1.04 WORK BY OTHERS

A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract: NONE

1.05 CODES, REGULATIONS, AND STANDARDS

A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this Project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.

B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.06 PROJECT RECORD DOCUMENTS

A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:

(1) Contract Drawings.

(2) Specifications.

(3) Addenda.

(4) Change Orders and other modifications to the Contract.

(5) Reviewed shop drawings, product data, and samples.

(6) Field test records.

(7) Inspection certificates.

(8) Manufacturer's certificates.

B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.

C. Contractor shall record information concurrent with construction progress.

D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:

(1) Manufacturer's name and product model and number.

(2) Product substitutions or alternates utilized.

(3) Changes made by Addenda and Change Orders and written directives.

1.07 EXAMINATION OF EXISTING CONDITIONS

A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets or roads approaching the Site.

B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.

C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the District and the Architect.

1.08 CONTRACTOR'S USE OF PREMISES

A. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District

chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.

B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.

C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.

D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.

E. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.

F. The Contractor shall install the construction fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the District.

1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.

B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS

A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services shall be performed by the Contractor.

B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

1.11 STRUCTURAL INTEGRITY

A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.

B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 25 13

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. Instructions to Bidders;

B. General Conditions, including, without limitation, Substitutions For Specified Items; and

C. Special Conditions.

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT

A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.

B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the District and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.

C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions. The District's Board has found and determined that certain item(s) shall be used on this Project based on the purpose(s) indicated pursuant to Public Contract Code section 3400(c). These findings, as well as the products and brand or trade names, have been identified in the Notice to Bidders.

D. The Contractor will not be allowed to substitute specified items unless the request for substitution is submitted as follows:

(1) District must receive any notice of request for substitution of a specified item a minimum of ten (10) calendar days prior to bid opening.

(2) Within 35 days after the date of the Notice of Award, the Contractor 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 technical Specifications. Insufficient information shall be grounds for rejection of substitution.

E. If the District and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the District and/or Architect to be unacceptable, the specified material or equipment shall be provided.

F. Samples may be required. Tests required by the District and/or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the District.

G. In reviewing the supporting data submitted for substitutions, the District and/or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two (2) submissions of supporting data are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the District will deduct the costs from the Contract Price. The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute.

H. 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. 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.

I. 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.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 26 00

CHANGES IN THE WORK

CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE PROVISIONS IN THE AGREEMENT, GENERAL CONDITIONS, AND SPECIAL CONDITIONS, IF USED, RELATED TO CHANGES AND/OR REQUESTS FOR CHANGES.

END OF DOCUMENT

DOCUMENT 01 29 00

APPLICATION FOR PAYMENT AND CONDITIONAL AND UNCONDITIONAL WAIVER AND RELEASE FORMS

CONTRACTOR SHALL COMPLY WITH ALL PROVISIONS IN THE GENERAL CONDITIONS RELATED TO APPLICATIONS FOR PAYMENT AND/OR PAYMENTS.

CONDITIONAL WAIVER AND RELEASE
ON PROGRESS PAYMENT
(CIVIL CODE SECTION 8132)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check: _____

Amount of Check: $_____

Check Payable to: _____

Exceptions

This document does not affect any of the following:

(1) Retentions.

(2) Extras for which the claimant has not received payment.

(3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:

Date(s) of waiver and release: _____

Amount(s) of unpaid progress payment(s): $_____

(4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

UNCONDITIONAL WAIVER AND RELEASE
ON PROGRESS PAYMENT
(CIVIL CODE SECTION 8134)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Through Date: _____

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment: $_____

Exceptions

This document does not affect any of the following:

(1) Retentions.

(2) Extras for which the claimant has not received payment.

(3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

CONDITIONAL WAIVER AND RELEASE
ON FINAL PAYMENT
(CIVIL CODE SECTION 8136)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:

Amount of Check: $_____

Check Payable to: _____

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: $_____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

UNCONDITIONAL WAIVER AND RELEASE
ON FINAL PAYMENT
(CIVIL CODE SECTION 8138)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Name of Claimant: _____

Name of Customer: _____

Job Location: _____

Owner: _____

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

Exceptions

This document does not affect any of the following: _____

Disputed claims for extras in the amount of: $_____

Claimant's Signature: _____

Claimant's Title: _____

Date of Signature: _____

DOCUMENT 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions; and

B. Special Conditions.

1.02 PROGRESS MEETINGS:

A. Contractor shall schedule and hold regular weekly progress meetings after a minimum of one week's prior written notice of the meeting date and time to all Invitees as indicated below.

B. Location: Contractor's field office.

C. The Contractor shall notify and invite the following entities ("Invitees"):

(1) District Representative.

(2) Contractor.

(3) Contractor's Project Manager.

(4) Contractor's Superintendent.

(5) Subcontractors, as appropriate to the agenda of the meeting.

(6) Suppliers, as appropriate to the agenda of the meeting.

(7) Construction Manager, if any.

(8) Architect

(9) Engineer(s), if any and as appropriate to the agenda of the meeting.

(10) Others, as appropriate to the agenda of the meeting.

D. The District's and/or the Architect's Consultants will attend at their discretion, in response to the agenda.

E. The District representative, the Construction Manager, and/or another District Agent shall take and distribute meeting notes to attendees and other concerned parties. If exceptions are taken to anything in the meeting notes,

those exceptions shall be stated in writing to the District within five (5) working days following District's distribution of the meeting notes.

1.03 PRE-INSTALLATION/PERFORMANCE MEETING:

A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work: cutting and patching of plaster and roofing, and other weather-exposed and moisture-resistant products. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.

B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, Shop Drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated.

C. Contractor shall review in detail Project conditions, schedule, requirements for performance, application, installation, and quality of completed Work, and protection of adjacent Work and property.

D. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 32 13

SCHEDULING OF WORK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Summary of Work; and

D. Submittals.

1.02 SECTION INCLUDES

A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section.

(1) Development of schedule, cost and resource loading of the schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method ("CPM") scheduling ("CPM Schedule").

(2) CPM Schedule shall be cost loaded based on Schedule of Values as approved by District.

(3) Submit schedules and reports as specified in the General Conditions.

B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

1.03 CONSTRUCTION SCHEDULE

A. Within ten (10) days of being awarded the Contract and before request for first progress payment, the Contractor shall prepare and submit to the Project Manager a construction progress schedule conforming to the Milestone Schedule below.

B. The Construction Schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

C. Milestone Schedule:

ACTIVITY DESCRIPTION	REQUIRED COMPLETION
CONSTRUCTION STARTS **Phase 1: All work except windows and associated work for Buildings C, D, E and F**	**August 2, 2019**
FINAL PROJECT COMPLETION **Phase 2 Windows and associated work at Buildings C,D, E and F**	**180 days from Notice**

1.04 QUALIFICATIONS

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of [i.e., Primavera Project Planner]. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.

(1) The written statement shall identify the individual who will perform CPM scheduling.

(2) Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.

(3) Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths (¾) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.

B. District reserves the right to approve or reject Contractor's scheduler or consultant at any time. District reserves the right to refuse replacing of Contractor's scheduler or consultant, if District believes replacement will negatively affect the scheduling of Work under this Contract.

1.05 GENERAL

A. Progress Schedule shall be based on and incorporate milestone and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each milestone shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by District. Any such agreement shall be formalized by a Change Order.

(1) District is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.

(2) Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

(3) A schedule showing the work completed in less than the Contract Time, and that has been accepted by District, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both District and the Contractor.

C. Ownership Project Float: Neither the District nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.

(1) For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.

(2) Party A would not be responsible for the time since it did not consume the entire Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.

D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.

E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. District's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon District, or act to relieve Contractor of its responsibility for means and methods of construction.

F. Software: Use **Microsoft Project for Windows, latest version**. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District on compact disk at times requested by District.

G. Transmit each item under the form approved by District.

(1) Identify Project with District Contract number and name of Contractor.

(2) Provide space for Contractor's approval stamp and District's review stamps.

(3) Submittals received from sources other than Contractor will be returned to the Contractor without District's review.

1.06 INITIAL CPM SCHEDULE

A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule for up to ninety (90) calendar days after the Notice to Proceed.

B. Indicate detailed plan for the Work to be completed in first ninety (90) days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond ninety (90) calendar days in summary form.

C. Initial CPM Schedule shall be time scaled.

D. Initial CPM Schedule shall be cost and resource loaded. Accepted cost and resource loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed ninety (90) calendar days.

E. District and Contractor shall meet to review and discuss the Initial CPM Schedule within seven (7) calendar days after it has been submitted to District.

(1) District's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).

(2) Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by District. Contractor shall resubmit Initial CPM Schedule if requested by District.

F. If, during the first ninety (90) days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to District a written Time Impact Evaluation ("TIE") in accordance with Article 1.12 of this Section. The TIE shall be based on the most current update of the Initial CPM Schedule.

1.07 ORIGINAL CPM SCHEDULE

A. Submit a detailed proposed Original CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein.

B. Progress Schedule shall include or comply with following requirements:

(1) Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.

(2) No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by District.

(a) Activity durations shall be total number of actual work days required to perform that activity.

(3) The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.

(4) District furnished materials and equipment, if any, identified as separate activities.

(5) Activities for maintaining Project Record Documents.

(6) Dependencies (or relationships) between activities.

(7) Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

(a) Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.

(b) Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.

(8) Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.

(a) Include time for fabrication and delivery of manufactured products for the Work.

(b) Show dependencies between procurement and construction.

(9) Activity description; what Work is to be accomplished and where.

(10) The total cost of performing each activity shall be total of labor, material, and equipment, excluding overhead and profit of Contractor. Overhead and profit of the General Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value.

(11) Resources required (labor and major equipment) to perform each activity.

(12) Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

(13) Identify the activities which constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (10) days.

(14) Twenty (20) workdays for developing punch list(s), completion of punch-list items, and final clean up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.

(15) Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.

(16) Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.

(a) Also furnish for each Subcontractor, as determined by District, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

(b) Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.

(c) In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by District, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.

(d) Furnish schedule for Contractor/Subcontractor CPM schedule meetings which shall be held prior to submission of Original CPM schedule to District. District shall be permitted to attend scheduled meetings as an observer.

(17) Activity durations shall be in Work days.

(18) Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Progress Schedule shall exclude in its Work day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.

C. Original CPM Schedule Review Meeting: Contractor shall, within sixty (60) days from the Notice to Proceed date, meet with District to review the Original CPM Schedule submittal.

(1) Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by District, in attendance. The meeting will take place over a continuous one (1) day period.

(2) District's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:

(a) Clarifications of Contract Requirements.

(b) Directions to include activities and information missing from submittal.

(c) Requests to Contractor to clarify its schedule.

(3) Within five (5) days of the Schedule Review Meeting, Contractor shall respond in writing to all questions and comments expressed by District at the Meeting.

1.08 ADJUSTMENTS TO CPM SCHEDULE

A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review meeting and resubmit network diagrams and reports for District's review.

(1) District, within ten (10) days from date that Contractor submitted the revised schedule, will either:

(a) Accept schedule and cost and resource loaded activities as submitted, or

(b) Advise Contractor in writing to review any part or parts of schedule which either do not meet Contract requirements or are unsatisfactory for District to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

(2) District may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.

(3) When schedule is accepted, it shall be considered the "Original CPM Schedule" which will then be immediately updated to reflect the current status of the work.

(4) District reserves right to require Contractor to adjust, add to, or clarify any portion of schedule which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by District will be based solely upon schedule's compliance with Contract requirements.

(1) By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.

(2) Upon submittal of schedule update, updated schedule shall be considered "current" CPM Schedule.

(3) Submission of Contractor's schedule to District shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to District for the record.

1.09 MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any anticipated changes to planned activities.

(1) Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.

(2) Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect "as built" information by indicating when activities were actually started and completed.

B. A meeting will be held on approximately the twenty-fifth (25th) of each month to review the schedule update submittal and progress payment application.

(1) At this meeting, at a minimum, the following items will be reviewed: Percent (%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.

(2) These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's General Superintendent and Scheduler.

(3) Contractor shall plan on the meeting taking no less than four (4) hours.

C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update.

D. Within five (5) work days of receipt of above noted revised submittals, District will either accept or reject monthly schedule update submittal.

(1) If accepted, percent (%) complete shown in monthly update will be basis for Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.

(2) If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.

E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to District by Contractor under this Contract, nor District's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

1.10 SCHEDULE REVISIONS

A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.

B. To reflect revisions to the Schedule, the Contractor shall provide District with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram which compares the original sequence to the revised sequence of work. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District. District may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide District with a complete written narrative response to District's request.

D. If the Contractor's revision is still not accepted by District, and the Contractor disagrees with District's position, the Contractor has seven (7) calendar days from receipt of District's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of District's written rejection of a schedule revision shall be contractually interpreted as acceptance of District's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding District's position.

E. At District's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

1.11 RECOVERY SCHEDULE

A. If the Schedule Update shows a completion date twenty-one (21) calendar days beyond the Contract Completion Date, or individual milestone completion dates, the Contractor shall submit to District the proposed

revisions to recover the lost time within seven (7) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.

B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District.

C. If the Contractor's revisions are not accepted by District, District and the Contractor shall follow the procedures in paragraph 1.09.C, 1.09.D and 1.09.E above.

D. At District's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

1.12 TIME IMPACT EVALUATION ("TIE") FOR CHANGE ORDERS, AND OTHER DELAYS

A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within fourteen (14) calendar days from the Notice to Proceed a TIE which includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it impacts the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable District to evaluate the impact of changed Work to the scheduled critical path.

B. Contractor shall be required to comply with the requirements of Paragraph 1.09.A for all types of delays such as, but not limited to, Contractor/Subcontractor delays, adverse weather delays, strikes, procurement delays, fabrication delays, etc.

C. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with four (4) copies of each TIE.

D. Once agreement has been reached on a TIE, the Contract Time will be adjusted accordingly. If agreement is not reached on a TIE, the Contract Time may be extended in an amount District allows, and the Contractor may submit a claim for additional time claimed by contractor.

1.13 TIME EXTENSIONS

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, impact the critical path of the current schedule update. Notice of time impacts shall be given in accord with the General Conditions.

B. Where an event for which District is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan,

including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate District-caused time impact. The Contractor shall submit its mitigation plan to District within fourteen (14) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. District will not be obligated to consider any time extension request unless the Contractor complies with the requirements of Contract Documents.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the required fourteen (14) calendar days for any issue, it is mutually agreed that the Contractor does not require a time extension for said issue.

1.14 SCHEDULE REPORTS

A. Submit four (4) copies of the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.

B. Required Reports:

(1) Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.

(2) Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.

(3) Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.

(4) Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.

(5) Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.

C. Other Reports:

In addition to above reports, District may request, from month to month, any two of the following reports. Submit four (4) copies of all reports.

(1) Activities by early start.

(2) Activities by late start.

(3) Activities grouped by Subcontractors or selected trades.

(4) Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.

D. Furnish District with report files on compact disks containing all schedule files for each report generated.

1.15 PROJECT STATUS REPORTING

A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to District. Written status reports shall include:

(1) Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.

(2) Progress made on critical activities indicated on CPM Schedule.

(3) Explanations for any lack of work on critical path activities planned to be performed during last month.

(4) Explanations for any schedule changes, including changes to logic or to activity durations.

(5) List of critical activities scheduled to be performed next month.

(6) Status of major material and equipment procurement.

(7) Any delays encountered during reporting period.

(8) Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.

(a) Actual resource shall be accumulated in field by Contractor, and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.

(b) Contractor shall explain all variances and mitigation measures.

(9) Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by District at no additional cost.

(10) Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

1.16 WEEKLY SCHEDULE REPORT

At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled three (3) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update).

1.17 DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to District for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, manpower, and man-hours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of District, furnish computer disk of this data base. Obtain District's written approval of daily construction report data base format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.

C. Weather, temperature, and any unusual site conditions.

D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.

E. Worker quantities for its own Work force and for Subcontractors of any tier.

F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

1.18 PERIODIC VERIFIED REPORTS

Contractor shall complete and verify construction reports on a form prescribed by the Division of the State Architect and file reports on the first day of February, May, August, and November during the preceding quarter year; at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the services of Contractor or any of Contractor's Subcontractors are terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications;

B. Special Conditions.

1.02 SECTION INCLUDES:

A. Definitions:

(1) Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.

(2) "Manufactured" applies to standard units usually mass-produced; "fabricated" means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.

(3) Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with a specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the District, the Architect, and all other concerned parties and shall furnish, install, or perform the work, at a minimum, in accordance with those instructions.

B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:

(1) Contractor shall submit all Shop Drawings, Product Data, and Samples to the District, the Architect, the Project Inspector, and the Construction Manager.

(2) Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.

(3) Contractor shall allow sufficient time so that no delay occurs due to required lead time in ordering or delivery of any item to the Site. Contractor shall be responsible for any delay in progress of Work due to its failure to observe these requirements.

(4) Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.

(5) Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and "cuts" shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.

(6) When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.

(7) Contractor shall certify on submittals for review that submittals conform to Contract requirements. Also certify that Contractor-furnished equipment can be installed in allocated space. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Submittals shall not be used as a means of requesting a substitution.

(8) Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.

(9) Upon demand by Architect or District, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

(1) Contractor shall prepare its proposed submittal schedule that is coordinated with the proposed construction schedule and submit both to the District within ten (10) days after the date of the Notice to Proceed. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the District.

(2) Contractor is responsible for all lost time should the initial submittal be rejected, marked "revise and resubmit", etc.

(3) 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.

(4) Contractor may be assessed $100 a day for each day it is late in submitting a shop drawing or sample. No extensions of time will be granted to Trade Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule.

1.03 SHOP DRAWINGS:

A. Contractor shall submit one reproducible transparency and six (6) opaque reproductions. The District will review and return the reproducible copy and one (1) opaque reproduction to Contractor.

B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.

C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases original Contract Documents shall take precedence as outlined under General Conditions.

D. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals.

E. District shall not review Shop Drawings for quantities of materials or number of items supplied.

F. District's and/or Architect’s review of Shop Drawing will be general. District and/or Architect review does not relieve Contractor of responsibility for dimensions, accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. The District’s and/or Architect’s review of Shop Drawings is not to be construed as approving departures from Contract Documents.

G. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.

H. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy, and confirm that all Work

contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.

I. Submitted drawings and details must bear stamp of approval of Contractor:

(1) Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.

(2) If Contractor submits a Shop Drawing without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked, the District and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.

J. Submission of Shop Drawings (in either original submission or when resubmitted with correction) constitutes evidence that Contractor has checked all information thereon and that it accepts and is willing to perform Work as shown.

K. Contractor shall pay for cost of any changes in construction due to improper checking and coordination. Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the District, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.

L. Shop Drawings must clearly delineate the following information:

(1) Project name and address.

(2) Specification number and description.

(3) Architect's name and project number.

(4) Shop Drawing title, number, date, and scale.

(5) Names of Contractor, Subcontractor(s) and fabricator.

(6) Working and erection dimensions.

(7) Arrangements and sectional views.

(8) Necessary details, including complete information for making connections with other Work.

(9) Kinds of materials and finishes.

(10) Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

M. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.

(1) Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.

(2) Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions. The Contractor shall check and approve all submittal(s) before submitting them for final review.

1.04 PRODUCT DATA OR NON REPRODUCIBLE SUBMITTALS:

A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contract must submit a minimum of six (6) each, to the District. District shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.

B. Contractor shall submit six (6) copies of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable.

C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.

D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.

E. Imported Materials Certification must be submitted at least ten (10) days before material is delivered.

1.05 SAMPLES:

A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.

B. Contractor shall submit four (4) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.

(1) Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.

(2) Samples must show full range of texture, color, and pattern.

C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the District in writing to this effect.

D. Samples to be shipped prepaid or hand-delivered to the District.

E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.

F. Contractor shall not deliver any material to Site prior to receipt of District's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.

G. District's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.

H. After a material has been approved, no change in brand or make will be permitted.

I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ninety (90) days before such materials are required to be used in Work.

J. Samples which are rejected must be resubmitted promptly after notification of rejection and be marked "Resubmitted Sample" in addition to other information required.

K. Field Samples and Mock-Ups are to be removed by Contractor at District's direction:

(1) Size: As Specified.

(2) Furnish catalog numbers and similar data, as requested.

1.06 REVIEW AND RESUBMISSION REQUIREMENTS:

A. The District will arrange for review of Sample(s), Shop Drawing(s), Product Data, and other submittal(s) by appropriate reviewer and return to Contractor as provided below within twenty-one (21) days after receipt or within twenty-one (21) days after receipt of all related information necessary for such review, whichever is later.

B. One (1) copy of product or materials data will be returned to Contractor with the review status.

C. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.

D. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within fourteen (14) days after receipt thereof or within fourteen (14) days after receipt of all related information necessary for such review. Such resubmittal shall not delay the Work.

E. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the District and/or the Architect's notes and comments.

F. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.

G. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) designated as revise and resubmit or rejected and requiring resubmittal, shall be revised or corrected and resubmitted to the District no later than fourteen (14) days or a shorter period as required to comply with the approved Construction Schedule, after its return to Contractor.

H. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents, or relieve Contractor of any obligation thereunder.

I. District's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 35 13.23

SITE STANDARDS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including without limitation, Site Access, Conditions, and Regulations;

B. Special Conditions;

C. Drug-Free Workplace Certification;

D. Tobacco-Free Environment Certification;

E. Criminal Background Investigation/Fingerprinting Certification;

F. Temporary Facilities and Controls.

1.02 REQUIREMENTS OF THE DISTRICT:

A. Drug-Free Schools and Safety Requirements:

(1) All school sites and other District Facilities have been declared "Drug-Free Zones." No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds on District property. No students, staff, visitors, or contractors are to use drugs on these sites.

(2) 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. Contractor shall post: "Non-Smoking Area" in a highly visible location in each work area, staging area, and parking area. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area is to be kept clean at all times.

(3) Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.

B. Language: Profanity or other unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students, staff, volunteers, parents or public will not be allowed.

C. Disturbing the Peace (Noise and Lighting):

(1) Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.

(2) The use of radios, etc., shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of radios at the Site, except for mobile phones or other handheld communication radios.

(3) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

D. Traffic:

(1) Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.

(2) All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.

(3) District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.

(4) Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in softscape areas that could otherwise be damaged.

E. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Obtaining of Permits, Licenses and Registrations and Work to Comply with All Applicable Laws and Regulations;

B. Special Conditions; and

C. Quality Control.

1.02 DESCRIPTION:

This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.03 REQUIREMENTS OF REGULATORY AGENCIES:

A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction over the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the District and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations ("CCR").

(1) California Building Standards Administrative Code, Part 1, Title 24, CCR.

(2) California Building Code (CBC), Part 2, Title 24, CCR; (International Building Code volumes 1-2 and California Amendments).

(3) California Electrical Code (CEC), Part 3, Title 24, CCR; (National Electrical Code and California Amendments).

(4) California Mechanical Code (CMC), Part 4, Title 24, CCR; (Uniform Mechanical Code and California Amendments).

(5) California Plumbing Code (CPC), Part 5, Title 24, CCR; (Uniform Plumbing Code and California Amendments).

(6) California Fire Code (CFC), Part 9, Title 24, CCR; (International Fire Code and California Amendments).

(7) California Referenced Standards Code, Part 12, Title 24, CCR.

(8) State Fire Marshal Regulations, Public Safety, Title 19, CCR.

(9) Partial List of Applicable National Fire Protection Association (NFPA) Standards:

(a) NFPA 13 - Automatic Sprinkler System.

(b) NFPA 14 - Standpipes Systems.

(c) NFPA 17A - Wet Chemical System

(d) NFPA 24 - Private Fire Mains.

(e) (California Amended) NFPA 72 - National Fire Alarm Codes.

(f) NFPA 253 - Critical Radiant Flux of Floor Covering System.

(g) NFPA 2001 - Clean Agent Fire Extinguishing Systems.

(10) California Division of the State Architect interpretation of Regulations ("DSA IR"), including, without limitation:

(a) DSA IR A-6 — Construction Change Document Submittal and Approval Processes.

(b) DSA IR A-7 — Project Inspector Certification and Approval.

(c) DSA IR A-8 — Project Inspector and Assistant Inspector Duties and Performance.

(d) DSA IR A-12 — Assistant Inspector Approval.

(11) DSA Procedures ("DSA PR")

(a) DSA PR 13-01 – Construction Oversight Process

(b) DSA PR 13-02 – Project Certification Process

B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, CCR, and the most current version on the date the bids are opened and as it pertains to school construction including, without limitation:

(1) Test and testing laboratory per Section 4-335. District shall pay for the testing laboratory.

(2) Special inspections per Section 4-333(c).

(3) Deferred Approvals per section 4-317(g).

(4) Verified reports per Sections 4-336 & 4-343(c).

(5) Duties of the Architect & Engineers shall be per Sections 4-333(a) and 4-341.

(6) Duties of the Contractor shall be per Section 4-343.

(7) Duties of Project Inspector shall be per Section 4-334.

(8) Addenda and Construction Change Documents per Section 4-338.

Contractor shall keep and make available all applicable parts of the most current version of Title 24 referred to in the plans and specifications at the Site during construction.

C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be per Title 24 requirements to the DSA.

(1) Contractor shall submit the following to Architect for review and endorsement:

(a) Product information on proposed material/system supplier.

(b) Drawings, specifications, and calculations prepared, signed, and stamped by an architect or engineer licensed in the State of California for that portion of the Work.

(c) All other requirements as may be required by DSA.

(2) Cost of preparing and submitting documentation per DSA Deferred Approval requirements including required modifications to Drawings and Specifications, whether or not indicated in the Contract Documents, shall be borne by Contractor.

(3) Contractor shall not begin fabrication and installation of deferred approval items without first obtaining DSA approval of Drawings and Specifications.

(4) Schedule of Work Subject to DSA Deferred Approval: Window wall systems exceeding 10 feet in span.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions including without limitation, Definitions;

B. Special Conditions.

1.02 DOCUMENT INCLUDES:

A. Abbreviations used throughout the Contract Documents.

B. Reference to a technical society, organization, or body is by abbreviation, as follows:

1.	AA	The Aluminum Association
2.	AAMA	American Architectural Manufacturers Association
3.	AASHTO	American Association of State Highway and Transportation Officials
4.	ABPA	Acoustical and Board Products Association
5.	ACI	American Concrete Institute
6.	AGA	American Gas Association
7.	AGC	Associated General Contractors of America
8.	AHC	Architectural Hardware Consultant
9.	AI	Asphalt Institute
10.	AIA	American Institute of Architects
11.	AIEE	American Institute of Electrical Engineers
12.	AISC	American Institute of Steel Construction
13.	AISI	American Iron and Steel Institute
14.	AMCA	Air Moving and Conditioning Association
15.	ANSI	American National Standards Institute
16.	APA	American Plywood Association
17.	ARI	Air Conditioning and Refrigeration Institute
18.	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
19.	ASME	American Society of Mechanical Engineers
20.	ASSE	American Society of Structural Engineers
21.	ASTM	American Society of Testing and Materials
22.	AWPB	American Wood Preservers Bureau
23.	AWPI	American Wood preservers Institute
24.	AWS	American Welding Society
25.	AWSC	American Welding Society Code
26.	AWI	Architectural Woodwork Institute
27.	AWWA	American Water Works Association
28.	BIA	Brick Institute of America

29.	CCR	California Code of Regulations
30.	CLFMI	Chain Link Fence Manufacturers Institute
31.	CMG	California Masonry Guild
32.	CRA	California Redwood Association
33.	CRSI	Concrete Reinforcing Steel Institute
34.	CS	Commercial Standards
35.	CSI	Construction Specifications Institute
36.	CTI	Cooling Tower Institute
37.	FGMA	Flat Glass Manufacturer's Association
38.	FIA	Factory Insurance Association
39.	FM	Factory Mutual
40.	FS	Federal Specification
41.	FTI	Facing Title Institute
42.	GA	Gypsum Association
43.	ICC	International Code Council
44.	IEEE	Institute of Electrical and Electronic Engineers
45.	IES	Illumination Engineering Society
46.	LIA	Lead Industries Association
47.	MIA	Marble Institute of America
48.	MLMA	Metal Lath Manufacturers Association
49.	MS	Military Specifications
50.	NAAMM	National Association of Architectural Metal Manufacturers
51.	NBHA	National Builders Hardware Association
52.	NBFU	National Board of Fire Underwriters
53.	NBS	National Bureau of Standards
54.	NCMA	National Concrete Masonry Association
55.	NEC	National Electrical Code
56.	NEMA	National Electrical Manufacturers Association
57.	NFPA	National Fire Protection Association/National Forest Products Association
58.	NMWIA	National Mineral Wool Insulation Association
59.	NTMA	National Terrazzo and Mosaic Association
60.	NWMA	National Woodwork Manufacturer's Association
61.	ORS	Office of Regulatory Services (California)
62.	OSHA	Occupational Safety and Health Act
63.	PCI	Precast Concrete Institute
64.	PCA	Portland Cement Association
65.	PDCA	Painting and Decorating Contractors of America
66.	PDI	Plumbing Drainage Institute
67.	PEI	Porcelain Enamel Institute
68.	PG&E	Pacific Gas & Electric Company
69.	PS	Product Standards
70.	SDI	Steel Door Institute; Steel Deck Institute
71.	SJI	Steel Joist Institute
72.	SSPC	Steel Structures Painting Council
73.	TCA	Tile Council of America
74.	TPI	Truss Plate Institute
75.	UBC	Uniform Building Code
76.	UL	Underwriters Laboratories Code
77.	UMC	Uniform Mechanical Code
78.	USDA	United States Department of Agriculture
79.	VI	Vermiculite Institute

80.	WCLA	West Coast Lumberman's Association
81.	WCLB	West Coast Lumber Bureau
82.	WEUSER	Western Electric Utilities Service Engineering Requirements
83.	WIC	Woodwork Institute of California
84.	WPOA	Western Plumbing Officials Association

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 42 16

DEFINITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions including without limitation, Definitions;

B. Special Conditions.

1.02 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, or Federal Standards, Contractor shall comply with requirements of the standard, except when more rigid requirements are specified in the Contract Documents, or are required by applicable codes.

B. Contractor shall conform to current reference standard publication date in effect on the date of bid opening.

C. Contractor shall obtain copies of standards unless specifically required not to by the Contract Documents.

D. Contractor shall maintain a copy of all standards at jobsite during submittals, planning, and progress of the specific Work, until final completion, unless specifically required not to by the Contract Documents.

E. Should specified reference standards conflict with Contract Documents, Contractor shall request clarification from the District and/or the Architect before proceeding.

F. The contractual relationship of the parties to the Contract shall not be altered from the contractual relationship as indicated in the Contract Documents by mention or inference otherwise in any referenced document.

G. Governing Codes shall be as shown in the Contract Documents including, without limitation, the Specifications.

END OF DOCUMENT

DOCUMENT 01 42 19

REFERENCES

PART 1 - GENERAL

1.01 SCHEDULE OF REFERENCES:

The following information is intended only for the general assistance of the Contractor, and the District does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

AA	The Aluminum Association 1400 Crystal Drive, Suite 430 Arlington, VA 22202 www.aluminum.org	703/358-2960
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005 www.aabc.com	202/737-0202
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 550 Schaumburg, IL 60173-4268 www.aamanet.org	847/303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 N Capitol St. NW - Suite 249 Washington, DC 20001 www.transportation.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709 2215 www.aatcc.org	919/549-8141
ACA	American Coatings Association 1500 Rhode Island Ave., NW Washington DC, 20005 www.paint.org	202/462-6272

ACI	American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 www.concrete.org	248/848-3700
ACPA	American Concrete Pipe Association 8445 Freeport Parkway, Suite 350 Irving, TX 75063-2595 www.concrete-pipe.org	972/506-7216
ADC	Air Duct Council 1901 N. Roselle Road, Suite 800 Schaumburg, Illinois 60195 www.flexibleduct.org	847/706-6750
AF&PA	American Forest and Paper Association 1101 K Street, NW, Suite 700 Washington, DC 20005 www.afandpa.org	202/463-2700
AGA	American Gas Association 400 North Capitol Street, NW Washington, DC 20001 www.aga.org	202/824-7000
AGC	Associate General Contractors of America 2300 Wilson Blvd., Suite 300 Arlington, VA 22201 www.agc.org	703/548-3118
AHA	American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 domensino.com/AHA/default.htm	847/934-8800
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 www.asphaltinstitute.org	859/288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction 130 East Randolph Street Suite 2000 Chicago, IL 60601 www.aisc.org	312.670.2400

AIA	American Insurance Association (formerly the National Board of Fire Underwriters) 555 12th St, NW, Suite 550 Washington DC 20004 www.aiadc.org	202/828-7100
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org	202/452.7100
AITC	American Institute of Timber Construction 7012 S. Revere Parkway Suite 140 Centennial, CO 80112 www.aitc-glulam.org	503/639.0651
ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	214/565-0593
ALSC	American Lumber Standards Committee, Inc. 7470 New Technology Way, Suite F Frederick, MD 21703 www.alsc.org	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org	847/394-0150
ANLA	American Nursery & Landscape Association (now AmericanHort) 525 9th St NW, Suite 80 Washington, DC 20004 www.americanhort.org	202/789-2900
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC, 20036 www.ansi.org	202/293.8020
APA	APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org	253/565-6600

APA	Architectural Precast Association 325 John Know Rd, Ste L103 Tallahassee, FL 32303 www.archprecast.org	850/205.5637
ARI	Air Conditioning and Refrigeration Institute (now Air-Conditioning, Heating, & Refrigeration Institute) 2111 Wilson Blvd, Suite 500 Arlington, VA 22201 www.ahrinet.org	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association Public Information Department 750 National Press Building 529 14th Street, NW Washington, DC 20045 www.asphaltroofing.org	202/591-2450
ASA	The Acoustical Society of America ASA Office Manager Suite 1NO1 2 Huntington Quadrangle Melville, NY 11747-4502 http://asa.aip.org	516/576-2360
ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org	800/548-2723 703/295-6300
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 www.asla.org	202/898-2444
ASME	American Society of Mechanical Engineers Three Park Avenue New York, NY 10016-5990 www.asme.org	800/434-2763
ASPE	American Society of Plumbing Engineers 2980 S River Rd. Des Plaines, IL 60018 http://aspe.org	847/296-0002

ASQ	American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 http://asq.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 901 Canterbury, Suite A Westlake, Ohio 44145 www.asse-plumbing.org	440/835-3040
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 www.astm.org	610/832-9500
AWCI	Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 www.awci.org	703/538-1600
AWPA	American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784 www.awpa.com	205/733-4077
AWPI	American Wood Preservers Institute 2750 Prosperity Ave. Suite 550 Fairfax, VA 22031-4312 www.arcat.com	800/356-AWPI 703/204-0500
AWS	American Welding Society 8669 Doral Boulevard, Suite 130 Doral, Florida 33166 www.aws.org	800/443-9353 305/443-9353
AWI	Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 www.awinet.org	571/323-3636
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794 7711

BHMA	Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th floor New York, NY 10017 www.buildershardware.com	212/297-2122
BIA	The Brick Industry Association 1850 Centennial Park Drive, Suite 301 Reston, VA 20191 www.gobrick.com	703/620-0010
CGA	Compressed Gas Association 14501 George Carter Way, Suite 103 Chantilly VA 20151-2923 www.cganet.com	703/788-2700
CISCA	Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 1064 Delaware Avenue SE Atlanta, GA 30316 www.cispi.org	404/622-0073
CLFMI	Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 www.associationsites.com/main-pub.cfm?usr=clfma	410/290-6267
CPA	Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 www.compositepanel.org	703/724-1128
CPSC	Consumer Product Safety Commission 4330 East West Highway Bethesda, MD 20814 www.cpsc.gov	301/504-7923 800/638-2772
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, CA 94949 www.calredwood.org	415/382-0662

CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, Georgia 30722-2048 www.carpet-rug.org	706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173 4758 www.crsi.org	847/517-1200
CSI	The Construction Specifications Institute 110 South Union Street, Suite 100 Alexandria VA 22314 www.csinet.org	800/689-2900
CTIOA	Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 www.ctioa.org	310/574-7800
DHI	Door and Hardware Institute (formerly National Builders Hardware Association) 14150 Newbrook Dr. Chantilly, VA 20151 www.dhi.org	703/222-2010
DIPRA	Ductile Iron Pipe Research Association 2000 2nd Avenue, South Suite 429 Birmingham, AL 35233 www.dipra.org	205/402-8700
DOC	U.S. Department of Commerce 1401 Constitution Ave., NW Washington, D.C. 20230 www.commerce.gov	202/482-2000
DOT	U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 www.dot.gov	855/368-4200
EJMA	Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 www.ejma.org	914/332-0040

EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov	202/272-0167
FCICA	Floor Covering Installation Contractors Association 7439 Millwood Drive West Bloomfield, MI 48322 www.fcica.com	248/661-5015 877/TO-FCICA
FM Global	Factory Mutual Insurance Company Amy Daley Global Practice Leader – Education, Public Entities, Health Care FM Global 270 Central Avenue Johnston, RI 02919-4949 www.fmglobal.com	401/275-3000 401/275-3029
FS	General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov	202/619-8925
GA	The Gypsum Association 6525 Belcrest Road, Suite 480 Hyattsville, MD 20782 www.gypsum.org	301/277-8686
GANA	Glass Association of North America 800 SW Jackson St., Suite 1500 Topeka, KS 66612-1200 www.glasswebsite.com	785/271-0208
HMA	Hardwood Manufacturers Association 665 Rodi Road, Suite 305 Pittsburgh, PA 15235 http://hmamembers.org	412/244-0440
HPVA	Hardwood Plywood & Veneer Association 1825 Michael Faraday Drive Reston, Virginia 20190 www.hpva.org	703/435-2900

IAPMO	International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 www.iapmo.org	909/472-4100
ICC	International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 www.iccsafe.org	888/422-7233
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org	212/419-7900
IES	Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 www.ies.org	212/248-5000
ITRK	Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 www.intertek.com	607/753-6711
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 www.mcaa.org	301/869-5800
MIA	Marble Institute of America 28901 Clemens Rd, Ste 100 Cleveland, OH 44145 www.marble-institute.com	440/250-9222
MMPA (formerly WMMPA)	Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 www.wmmpa.com	530/661-9591 800/550-7889

MSS	Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602 http://mss-hq.org	703/281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org	630/942-6591
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	703/684-0084
NAPA	National Asphalt Pavement Association 5100 Forbes Blvd. Lanham, MD USA 20706-4407 www.asphaltpavement.org	888/468-6499 301/731-4748
NCSPA	National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 LB9 Dallas, TX 75244 www.ncspa.org	972/850-1907
NCMA	National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 www.ncma.org	703/713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org	301/977-3698
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814 www.necanet.org	301/657-3110
NEMA	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1752 Rosslyn, Virginia 22209 www.nema.org	703/841-3200

NEII	National Elevator Industry, Inc. 1677 County Route 64 P.O. Box 838 Salem, New York 12865-0838 www.neii.org	518/854-3100
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts USA 02169-7471 www.nfpa.org	617/770-3000
NHLA	National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com	901/377-1818
NIA	National Insulation Association 12100 Sunset Hills Road, Suite 330 Reston, VA 20190 www.insulation.org	703/464-6422
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net	847/299-9070
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48113-0140, USA www.nsf.org	800/673-6275 734/769-8010
NTMA	National Terrazzo and Mosaic Association PO Box 2605 Fredericksburg, TX 78624 www.ntma.com	800/323-9736
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, D.C. 20210 www.osha.gov	800/321-OSHA (6742)

PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 500 New Jersey Ave., N.W. 7th Floor Washington, D.C. 20001 www.cement.org	847/966-6200 202/408-9494
PCI	Precast/Prestressed Concrete Institute 200 W. Adams St. #2100 Chicago, IL 60606 www.pci.org	312/786-0300
PDCA	Painting and Decorating Contractors of America 2316 Millpark Drive, Ste 220 Maryland Heights, MO 63043 www.pdca.com	800/332-PDCA (7322) 314/514-7322
PDI	Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org	978/557-0720 800/589-8956
PEI	Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com	770/676-9366
PG&E	Pacific Gas & Electric Company www.pge.com	800/743-5000
PLANET	Professional Landcare Network 950 Herndon Parkway, Suite 450 Herndon, Virginia 20170 www.landcarenetwork.org	703/736-9666 800/395-2522 703/736-9668
RFCI	Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange GA 30240 www.rfci.com	706/882-3833
RIS	Redwood Inspection Service 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.redwoodinspection.com	925/935-1499
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	847/458-4647

SDI	Steel Door Institute 30200 Detroit Road Westlake, Ohio 44145 www.steeldoor.org	440/899-0010
SJI	Steel Joist Institute 234 W. Cheves Street Florence, SC 29501 http://steeljoist.org	843/407-4091
SMA	Stucco Manufacturers Association 500 East Yale Loop Irvine, CA 92614 www.stuccomfgassoc.com	949/387.7611
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 www.smacna.org	703/803-2980
SPI	SPI: The Plastics Industry Trade Association, Inc. 1667 K St., NW, Suite 1000 Washington, DC 20006 www.plasticsindustry.org	202/974-5200
SSPC	Society for Protective Coatings (formerly the Steel Structures Painting Council) 40 24th St 6th Fl Pittsburgh, PA 15222 www.sspc.org	412/281-2331 877/281-7772
TCA	The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 www.tcnatile.com	864/646-8453
TPI	Truss Plate Institute 218 North Lee Street, Suite 312 Alexandria, VA 22314 www.tpinst.org	703/683-1010
TPI	Turfgrass Producers International 2 East Main Street East Dundee, IL 60118 www.turfgrasssod.org	800/405-8873 847/649-5555

TCIA	Tree Care Industry Association (formerly the National Arborist Association) 136 Harvey Road, Suite 101 Londonderry, NH 03053 www.tcia.org	800/733-2622
TVI	The Vermiculite Institute c/o The Schundler Company 150 Whitman Avenue Edison, NJ. 08817 www.vermiculiteinstitute.org	732/287-2244
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com	847/272-8800 877/854-3577
UNI	Uni-Bell PVC Pipe Association 2711 LBJ Freeway, Suite 1000 Dallas, TX 75234 www.uni-bell.org	972/243-3902
USDA	U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 www.usda.gov	202/720-2791
WA	Wallcoverings Association 401 North Michigan Avenue Suite 2200 Chicago, IL 60611 www.wallcoverings.org	312/321-5166

WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 or 6980 S.W. Varns Tigard, OR 97223 www.wclib.org	503/639-0651
WCMA	Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, New York 10017 www.wcmanet.org	212/297-2122
WDMA	Window & Door Manufacturers Association 401 N. Michigan Avenue, Suite 2200 Chicago, IL 60611 or 2025 M Street, NW, Ste. 800 Washington, D.C. 20036-3309 www.wdma.com	312/321-6802 202/367-1157
WI	Woodwork Institute P.O. Box 980247 West Sacramento, CA 95798 www.wicnet.org	916/372-9943
WRI	Wire Reinforcement Institute 942 Main Street Hartford, CT 06103 www.wirereinforcementinstitute.org	860/240-9545
WWCA	Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, California 92865 www.wwcca.org	714/221-5520
WWPA	Western Wood Products Association 522 SW Fifth Ave., Suite 500 Portland, OR 97204-2122 www2.wwpa.org	503/224-3930

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 43 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Purchase of Materials and Equipment;

B. Special Conditions;

C. Imported Materials Certification.

1.02 MATERIAL AND EQUIPMENT

A. Only items approved by the District and/or Design Professional shall be used.

B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

A. The District and/or Architect will provide a schedule of colors.

B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.

B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.

C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

D. Materials are not acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.

E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, access to the Site or buildings, and underground services. Contractor shall protect material and equipment furnished under Contract.

F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage at no cost to District.

G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.

B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).

B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.

B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar," should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF DOCUMENT

DOCUMENT 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Inspector, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;

B. Special Conditions.

1.02 RELATED CODES:

A. The Work is governed by requirements of Title 24, California Code of Regulations ("CCR"), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.

B. The Division of the State Architect ("DSA") shall be notified at or before the start of construction.

1.03 OBSERVATION AND SUPERVISION:

A. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, CCR, Part 1, Title 24, Section 4-341.

B. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District, referred to hereinafter as the "Project Inspector", will observe the work in accordance with CCR, Part 1, Title 24, Sections 4-333(b) and 4-342:

(1) The Project Inspector and Special Inspector(s) shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. The Contractor shall provide facilities and operation of equipment as needed, and access as required and shall provide assistance for sampling or measuring materials.

(2) The Project Inspector will notify the District and Architect and call the attention of the Contractor to any observed failure of Work or material to conform to Contract Documents.

(3) The Project Inspector shall observe and monitor all testing and inspection activities required.

The Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to CCR, Part 1, Title 24, Section 4-343. The Contractor shall supervise and direct the Work and maintain a competent superintendent on the job who is authorized to act in all matters pertaining to the Work. The Contractor's superintendent shall also inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by Part 1, Title 24, Section 4-336.

1.04 TESTING AGENCIES:

A. Testing agencies and tests shall be in conformance with the General Documents and the requirements of Part 1, Title 24, Section 4- 335.

B. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer, if any, referred to hereinafter as the "Soils Engineer."

C. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the "Testing Laboratory." The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

1.05 TESTS AND INSPECTIONS:

A. The Contractor shall be responsible for notifying the District and Project Inspector of all required tests and inspections. Contractor shall notify the District and Project Inspector at least seventy-two hours (72) hours in advance of performing any Work requiring testing or inspection.

B. The Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.

C. The District will pay for first inspections and tests required by the "CCR", and other inspections or tests that the District and/or the Architect may direct to have made, including the following principal items:

(1) Tests and observations for earthwork and paving.

(2) Tests for concrete mix designs, including tests of trial batches.

(3) Tests and inspections for structural steel work.

(4) Field tests for framing lumber moisture content.

(5) Additional tests directed by the District that establish that materials and installation comply with the Contract Documents.

(6) Tests and observations of welding and expansion anchors.

D. The District may at its discretion, pay and then back charge the Contractor for:

(1) Retests or reinspections, if required, and tests or inspections required due to Contractor error or lack of required identifications of material.

(2) Uncovering of work in accordance with Contract Documents.

(3) Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.

(4) Testing done off Site.

E. Testing and inspection reports and certifications:

(1) If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification.

(a) The District;

(b) The Construction Manager, if any;

(c) The Architect;

(d) The Consulting Engineer, if any;

(e) Other engineers on the Project, as appropriate;

(f) The Project Inspector; and

(g) The Contractor.

(2) When the test or inspection is one required by the CCR, a copy of the report shall also be provided to the DSA.

PART 2 - PRODUCTS

2.01 TYPE OF TESTS AND INSPECTIONS

A. Testing and inspection shall be in accordance with DSA Form 103 (or current version) (attached at end of document)

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DSA — DIVISION OF THE STATE ARCHITECT — DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #:

DSA File No.:

Application No.: 01-116977

Date Submitted: 10/18/2017

Revised:

Revised:

School Name	Martin Elementary School	District	South San Francisco Unified School District

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[1]	PERFORMED BY[2]	CODE REFERENCE AND NOTES
+	**SOILS**			
-	**CONCRETE**			**Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13**
-	**7. CAST IN PLACE CONCRETE**			
	Material Verification and Testing:			
X	a. Verify use of required design mix.	Periodic	SI*	**Table 1705A.3 Item 5, 1910A.1** (1909.2.3[+]). * To be performed by qualified batch-plant inspector and concrete sampling technician
X	b. Identifiy, sample, and test reinforcing steel.	Test	LOR	**1910A.2** (1909.2.4[+]); ACI 318-14 Section 26.6.1.2. DSA IR 17-10.16
X	c. During concrete placement, fabricate specimens for strength tests,perform slump and air content tests, and determine the temperature of the concrete.	Test	LOR	**Table 1705A.3 Item 6**; ACI 318-14 Sections 26.5 & 26.12
X	d. Test concrete (f'_c).	Test	LOR	**1905A.1.16** (1909.3.7[+]); ACI 318-14 Section 26.12.
	Inspection:			
X	e. Batch plant inspection ◉ Continuous ○ Periodic	See Notes	SI	Default of **'Continuous'** per **1705A.3.3**; If approved by DSA, batch plant inspection may be reduced to **'Periodic'** subject to requirements in Section **1705A.3.3.1** or eliminated per **1705A.3.3.2**. (See Appendix for exemptions.)
-	**11. POST-INSTALLED ANCHORS:**			
X	a. Inspect installation of post-installed anchors	See Notes	SI*	**Table 1705A.3 Item 4a (Continuous) & 4b (Periodic)** (see Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13 * May be performed by the project inspector when specifically approved by DSA.
X	b. Test post-installed anchors.	Test	LOR	**1910A.5** (1909.2.7[+]). (See Appendix for exemptions.)
+	**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**
-	**19. WELDING:**			**1705A.2.5, Table 1705A.2.1 Items 4 & 5;** DSA IR 17-3, AWS D1.1 and AWS D1.8 for structural steel, AWS D1.2 for Aluminum, AWS D1.3 for cold-formed steel, AWS D1.4 for reinforcing steel. (See Appendix for exemptions.)
	Verification of Materials, Equipment, Welders, etc:			
X	a. Verify weld filler material identification markings per AWS designation listed on the DSA approved documents and the WPS.	Periodic	SI	DSA IR 17-3.
X	b. Verify weld filler material manufacturer's certificate of compliance.	Periodic	SI	DSA IR 17-3.
X	c. Verify WPS, welder qualifications and equipment.	Periodic	SI	DSA IR 17-3.
-	**19.1 SHOP WELDING:**			
X	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	Continuous	SI	**Table 1705A.2.1 Item 5a1-4.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	b. Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds	Periodic	SI	**1705A.2.2, Table 1705A.2.1 Item 5a.5 & 5a.6.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	c. Inspect welding of stairs and railing systems.	Periodic	SI	**1705A.2.1.** Per AISC 360-10 (and AISC 341-10 as applicable). AWS D1.1 & D1.3. DSA IR 17-3.
-	**19.2 FIELD WELDING:**			
X	a. Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	Continuous	SI	**Table 1705A.2.1 Item 5a1-4.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	b. Inspect single-pass fillet welds ≤ 5/16"	Periodic	SI	**Table 1705A.2.1 Item 5a.5.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	f. Inspect welding of stairs and railing systems	Periodic	SI*	**1705A.2.1;** Per AISC 360-10 (and AISC 341-10 as applicable). AWS D1.1 & D1.3. DSA IR 17-3. * May be performed by the project inspector when specifically approved by DSA.
-	**23. ANCHOR BOLTS, ANCHOR RODS, & OTHER STEEL:**			
X	a. Anchor Bolts and Anchor Rods	Test	LOR	IR 17-11 Sample and test anchor bolts and anchor rods not readily identifiable.
+	**WOOD**			
+	**OTHER**			

List of required verified report(s):

1 All Structural Testing: Laboratory Verified Report - Form DSA-291

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA — DEPARTMENT OF GENERAL SERVICES — DIVISION OF THE STATE ARCHITECT

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.:

Application No.: 01-116977

Date Submitted: 10/18/2017

Revised:

Revised:

2 Concrete Batch Plant Inspection: Laboratory Verified Report - Form DSA-291

3 Shop Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292

4 Field Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292

KEY to Columns	
1 Type -	**2 Performed By -**
Continuous – Indicates that a continuous special inspection is required	**GE** – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
Periodic – Indicates that a periodic special inspection is required	**LOR** – 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.
Test – Indicates that a test is required	**SI** – Indicates that the special inspection is to be performed by a special inspector

Name of Architect or Engineer in general responsible charge

Kam Yan

Name of Structural Engineer (When structural design has been delegated)

Signature of Architect or Structural Engineer — date: 10/18/2017

IDENTIFICATION STAMP
DIV OF THE STATE ARCHITECT
APP. # 01-116977
AC N/A F/LS N/A SS NS
DATE 11/13/2018

Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing

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.	Soils:
	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:	
	Concrete/Masonry:
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."

Exempted by Design Prof.	Welding:
	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	
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).

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

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Revised:

Revised:

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.
(Optional) List details for applicable exempt items:	

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:	

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DOCUMENT 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Site Standards; and

D. Construction Waste Management and Disposal.

1.02 TEMPORARY UTILITIES:

A. Electric Power and Lighting:

(1) Contractor will pay for power during the course of the Work. To the extent power is available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use.

(2) Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.

(3) Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work.

(4) Contractor shall be responsible for maintaining existing lighting levels in the project vicinity should temporary outages or service interruptions occur.

B. Heat and Ventilation:

(1) Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified

minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.

(2) Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

(3) Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

C. Water:

(1) Contractor shall pay for water used during the course of the Work. Contractor shall coordinate and pay for installation or use of water meter in compliance with local water agency requirements. To the extent water is then available in the building(s) or on the Site, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location in the building(s), on the Site, or other location approved by the local water agency, to point of intended use.

(2) Contractor shall use backflow preventers on water lines at point of connection to District's water supply. Backflow preventers shall comply with requirements of Uniform Plumbing Code.

(3) Contractor shall make potable water available for human consumption.

D. Sanitary Facilities:

(1) Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the Inspector or Contractor completes all other work at the Site.

(2) Use of toilet facilities in the Work under construction shall not be permitted except by consent of the Inspector and the District.

E. Telephone Service:

(1) Contractor shall arrange with local telephone service company for telephone service as required for the performance of the Work. Contractor shall, at a minimum, provide in its field office one line for telephone and one line for fax machine.

(2) Contractor shall pay the costs for telephone and fax lines installation, maintenance, service, and removal.

F. Fire Protection:

(1) Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.

(2) Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

G. Trash Removal:

(1) Under no circumstance shall Contractor use District trash service.

H. Field Office:

(1) If Contractor chooses to provide a field office, it shall be an acceptable construction trailer that is well-lit and ventilated. The construction trailer shall be equipped with shelves, desks, filing cabinet, chairs, and such other items of equipment needed. Trailer and equipment are the property of the Contractor and must be removed from the Site upon completion of the Work. Contractor may use the corridor adjacent to the construction area for an office area, if approved in writing by District.

(2) Contractor shall provide any additional electric lighting and power required for the trailer. Contractor shall make adequate provisions for heating and cooling as required.

1.03 CONSTRUCTION AIDS:

A. Plant and Equipment:

(1) Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workers. Include elevators, hoists, debris chutes, and other equipment, tools, and appliances necessary for performance of the Work.

(2) Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

B. None of the District's tools and equipment shall be used by Contractor for the performance of the Work.

1.04 BARRIERS AND ENCLOSURES:

A. Contractor shall obtain the District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.

C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.

D. Tree and Plant Protection:

(1) Contractor shall preserve and protect existing trees and plants on the Premises that are not designated or required to be removed, and those adjacent to the Premises.

(2) Contractor shall provide barriers to a minimum height of 4'-0" around drip line of each tree and plant, around each group of trees and plants, as applicable, in the proximity of demolition and construction operations, or as denoted on the Plans.

(3) Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the District and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged materials as determined by the District.

(4) Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials which could be harmful to trees and plants, and replace with good soil, at Contractor's expense.

(5) Excavation around Trees:

(a) Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the District.

(b) Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the District. Main lateral roots and

taproots shall not be cut. All roots 2 inches in diameter and larger shall be tunneled under and heavily wrapped with wet burlap so as to prevent scarring or excessive drying. Smaller roots that interfere with installation of new work may be cut with prior approval by the District. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.

(c) Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.

(d) Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.

(e) Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.

(f) Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

1.05 SECURITY:

The Contractor shall be responsible for project security for materials, tools, equipment, supplies, and completed and partially completed Work.

1.06 TEMPORARY CONTROLS:

A. Noise Control:

(1) Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.

(2) Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the District a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration:

(1) Equipment and impact tools shall have intake and exhaust mufflers.

(2) Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.

C. Dust and Dirt:

(1) Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

(2) Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.

(3) Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.

(4) Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water:

(1) Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

E. Pollution:

(1) No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.

(2) Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

F. Lighting:

(1) If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.07 JOB SIGN(S):

A. General:

(1) Contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the District and/or the Design Professional; locate sign as approved by the District.

(2) Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

B. Materials:

(1) Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.

(2) Sign Surface: Minimum 3/4-inch exterior grade plywood.

(3) Rough Hardware: Galvanized.

(4) Paint: Exterior quality, of type and colors selected by the District and/or the Design Professional.

C. Fabrication:

(1) Contractor shall fabricate to provide smooth, even surface for painting.

(2) Size: 4'-0" x 8'-0", unless otherwise indicated.

(3) Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.

(4) Text and Graphics: As indicated.

1.08 PUBLICITY RELEASES:

A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s) without the written permission of the District.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF DOCUMENT

DOCUMENT 01 50 13

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions; and

C. Temporary Facilities and Controls.

1.02 SECTION INCLUDES:

A. Administrative and procedural requirements for the following:

(1) Salvaging non-hazardous construction waste.

(2) Recycling non-hazardous construction waste.

(3) Disposing of non-hazardous construction waste.

1.03 DEFINITIONS:

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 PERFORMANCE REQUIREMENTS:

A. General: Develop waste management plan that results in end-of Project rates for salvage/recycling of sixty-five percent (65%) by weight (or by volume, but not a combination) of total waste generated by the Work.

1.05 SUBMITTALS:

A. Waste Management Plan: Submit waste management plan within 30 days of date established for commencement of the Work.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:

(1) Material category.

(2) Generation point of waste.

(3) Total quantity of waste in tons or cubic yards.

(4) Quantity of waste salvaged, both estimated and actual in tons or cubic yards.

(5) Quantity of waste recycled, both estimated and actual in tons or cubic yards.

(6) Total quantity of waste recovered (salvaged plus recycled) in tons or cubic yards.

(7) Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for final payment, submit copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. 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.

G. 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.

H. Qualification Data: For Waste Management Coordinator.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

J. Submittal procedures and quantities are specified in Document 01 33 00.

1.06 QUALITY ASSURANCE:

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:

(1) Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

(2) Review requirements for documenting quantities of each type of waste and its disposition.

(3) Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

(4) Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

(5) Review waste management requirements for each trade.

1.07 WASTE MANAGEMENT PLAN:

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measurement throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

(1) Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

(2) Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

(3) Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

(4) Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

(5) Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

(6) Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION:

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

(1) Comply with Document 01 50 00 for operation, termination, and removal requirements.

B. **[**Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.**]**

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

(1) Distribute waste management plan to everyone concerned within 3 days of submittal return.

(2) Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

(1) Designate and label specific areas of Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

(2) Comply with Document 01 50 00 for controlling dust and dirt, environmental protection, and noise control.

3.02 RECYCLING CONSTRUCTION WASTE:

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

(1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.

(a) Inspect containers and bins for contamination and remove contaminated materials if found.

(2) Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

(3) Stockpile materials away from construction area. Do not store within drip line of remaining trees.

(4) Store components off the ground and protect from the weather.

(5) Remove recyclable waste off District property and transport to recycling receiver or processor.

D. Packaging:

(1) Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

(2) Polystyrene Packaging: Separate and bag material.

(3) Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on Site, break down pallets into component wood pieces and comply with requirements for recycling wood.

(4) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

E. Site-Clearing Wastes: Chip brush, branches, and trees on site.

F. Wood Materials:

(1) Clean Cut-Offs of Lumber: Grind or chip into small pieces.

(2) Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

(1) Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.03 DISPOSAL OF WASTE:

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

(1) Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.

(2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off District property and legally dispose of them.

END OF SECTION

SECTION 01 66 00

PRODUCT DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;

B. Special Conditions.

1.02 PRODUCTS

A. Products are as defined in the General Conditions.

B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.

C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.

B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.

C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.

C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 71 23

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;

B. Special Conditions;

C. Site-Visit Certification.

1.02 REQUIREMENTS INCLUDED:

A. Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:

(1) Survey work required in execution of the Project.

(2) Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEERS:

Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom District makes no objection.

1.04 SURVEY REFERENCE POINTS:

A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.

B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:

(1) Make no changes or relocation without prior written notice to District and Architect.

(2) Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

(3) Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

1.05 RECORDS:

Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

1.06 SUBMITTALS:

A. Contractor shall submit name and address of Surveyor and Professional Engineer to District and Architect prior to its/their work on the Project.

B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.

C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION

3.01 COMPLIANCE WITH LAWS:

Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

3.02 NONCONFORMING WORK:

Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF DOCUMENT

DOCUMENT 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;

B. Special Conditions;

C. Hazardous Materials Procedures and Requirements;

D. Hazardous Materials Certification;

E. Lead-Based Paint Certification;

F. Imported Materials Certification.

1.02 CUTTING AND PATCHING:

A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:

(1) Make several parts fit together properly.

(2) Uncover portions of Work to provide for installation of ill-timed Work.

(3) Remove and replace defective Work.

(4) Remove and replace Work not conforming to requirements of Contract Documents.

(5) Remove Samples of installed Work as specified for testing.

(6) Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

(7) Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.

B. In addition to Contract requirements, upon written instructions from the District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by District; and remove Work to provide for alteration of existing Work.

C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

1.03 SUBMITTALS:

A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:

(1) The work of the District or other trades.

(2) Structural value or integrity of any element of Project.

(3) Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.

(4) Efficiency, operational life, maintenance or safety of operational elements.

(5) Visual qualities of sight-exposed elements.

B. Contractor's Request shall also include:

(1) Identification of Project.

(2) Description of affected Work.

(3) Necessity for cutting, alteration, or excavations.

(4) Effects of Work on District, other trades, or structural or weatherproof integrity of Project.

(5) Description of proposed Work:

(a) Scope of cutting, patching, alteration, or excavation.

(b) Trades that will execute Work.

(c) Products proposed to be used.

(d) Extent of refinishing to be done.

(6) Alternates to cutting and patching.

(7) Cost proposal, when applicable.

(8) The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.

(9) Written permission of District or other District contractor(s) whose work will be affected.

1.04 QUALITY ASSURANCE:

A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.

B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

1.05 PAYMENT FOR COSTS:

A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the District.

B. District shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the District.

B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 – EXECUTION

3.01 INSPECTION:

A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

B. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

3.02 PREPARATION:

A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.

B. Contractor shall provide devices and methods to protect other portions of Project from damage.

C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION:

A. With respect to performance, Contractor shall:

(1) Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.

(2) Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.

(3) Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.

B. Contractor shall employ original installer or fabricator to perform cutting and patching for:

(1) Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.

(2) Sight-exposed finished surfaces.

C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.

D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

E. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with

requirements of the Contract Documents and as required to match surrounding areas and surfaces.

F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT

DOCUMENT 01 76 00

ALTERATION PROJECT PROCEDURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Integration of Work, Purchase of Materials and Equipment, Uncovering of Work and Non-conforming Work and Correction of Work and Trenches;

B. Special Conditions.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING AND EXTENDING WORK:

A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.

B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.

B. By beginning restoration Work, Contractor acknowledges and accepts the existing conditions.

3.02 PREPARATION:

A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.

B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.

C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.

D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.

E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

3.03 INSTALLATION:

A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate District occupancy.

B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.

C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.

D. Contractor shall refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat and square or straight transition to adjacent finishes.

E. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

3.04 TRANSITIONS:

A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must 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, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the District and the Architect for review and approval.

3.05 ADJUSTMENTS:

A. Where removal of partitions or walls results in adjacent spaces becoming one, Contractor shall rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the District and the Architect for review and approval.

C. Contractor shall trim and seal existing wood doors and shall trim and paint metal doors as necessary to clear new floor finish and refinish trim as required.

D. Contractor shall fit Work at penetrations of surfaces.

3.06 REPAIR OF DAMAGED SURFACES:

A. Contractor shall patch or replace portions of existing surfaces, which are damaged, lifted, discolored, or showing other imperfections, in the area where the Work is performed.

B. Contractor shall repair substrate prior to patching finish.

3.07 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS:

A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.

B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.

C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified in the Contract Documents, including without limitation, the Drawings.

3.08 FINISHES:

A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.

B. Contractor shall finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, Contractor shall refinish entire surface to nearest intersections.

3.09 CLEANING:

A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF DOCUMENT

DOCUMENT 01 77 00

CONTRACT CLOSEOUT AND FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of Work;

B. Special Conditions;

C. Temporary Facilities and Controls.

1.02 CLOSEOUT PROCEDURES

Contractor shall comply with all closeout provisions as indicated in the General Conditions.

1.03 FINAL CLEANING

A. Contractor shall execute final cleaning prior to final inspection.

B. Contractor shall clean interior and exterior glass and all surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.

C. Contractor shall clean equipment and fixtures to a sanitary condition.

D. Contractor shall replace filters of operating equipment.

E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.

F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.

G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site and surrounding areas.

1.04 ADJUSTING

Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 RECORD DOCUMENTS AND SHOP DRAWINGS

A. Contractor shall legibly mark each item to record actual construction, including:

(1) Measured depths of foundation in relation to finish floor datum.

(2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.

(3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

(4) Field changes of dimension and detail.

(5) Details not on original Contract Drawings

(6) Changes made by modification(s).

(7) References to related Shop Drawings and modifications.

B. Contractor will provide one set of Record Drawings to District.

C. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.06 INSTRUCTION OF DISTRICT PERSONNEL

A. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six months or by the change of season.

C. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when the need for such data becomes apparent during instruction.

E. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

A. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.

B. Contractor shall provide District with all required Operation and Maintenance Data at one time. Partial or piecemeal submissions of Operation and Maintenance Data will not be accepted.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of the Work;

B. Special Conditions.

1.02 QUALITY ASSURANCE:

Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT:

A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").

B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.

D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.

E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME:

A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants,

Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

E. Text: Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

C. Contractor shall include color coded wiring diagrams as installed.

D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

G. Contractor shall include manufacturer's printed operation and maintenance instructions.

H. Contractor shall include sequence of operation by controls manufacturer.

I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Contractor shall provide control diagrams by controls manufacturer as installed.

K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.07 SUBMITTAL:

A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor’s start of Work.

B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft

content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.

D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of the Work;

B. Special Conditions.

1.02 QUALITY ASSURANCE:

Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT:

A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").

B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.

D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.

E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME:

A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

E. Text: Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.05 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

C. Contractor shall include color coded wiring diagrams as installed.

D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

G. Contractor shall include manufacturer's printed operation and maintenance instructions.

H. Contractor shall include sequence of operation by controls manufacturer.

I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Contractor shall provide control diagrams by controls manufacturer as installed.

K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.07 SUBMITTAL:

A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor’s start of Work.

B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.

D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 78 36

WARRANTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Warranty/Guarantee Information;

B. Special Conditions.

1.02 FORMAT

A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.

B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.

C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier; and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.

D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.03 PREPARATION:

A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of warranty blank until the date of completion is determined.

B. Contractor shall verify that documents are in proper form, contain full information, and are notarized, when required.

C. Contractor shall co-execute submittals when required.

D. Contractor shall retain warranties until time specified for submittal.

1.04 TIME OF SUBMITTALS:

A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.

B. Contractor shall submit for District approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the District prior to District's approval of Contractor's final Application for Payment.

C. For items of work delayed beyond date of completion, Contractor shall provide an updated submittal within ten (10) days after acceptance, listing the date of acceptance as start of warranty period.

PART 2 - PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

DOCUMENT 01 78 39

RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Documents on Work;

B. Special Conditions.

PART 2 - RECORD DRAWINGS

2.01 GENERAL:

A. As indicated in the Contract Documents, the District will provide Contractor with one set of reproducible, full size original Contract Drawings (mylars).

B. Contractor shall maintain at each Project Site one set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings ("As-Builts") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blueline prints.

C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.

D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor.

E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.02 RECORD DRAWING INFORMATION:

A. Contractor shall record the following information:

(1) Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

(2) Actual numbering of each electrical circuit to match panel schedule.

(3) Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.

(4) Locations of all items, not necessarily concealed, which vary from the Contract Documents.

(5) Installed location of all cathodic protection anodes.

(6) Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

(7) Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.

(8) Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.

In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

B. Contractor shall provide additional drawings as necessary for clarification.

C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

D. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide electronic copies of the drawings (in PDF format) with one file with all of the sheets and one set of individual sheet files at the conclusion of the Project.

PART 3 - RECORD SPECIFICATIONS

3.01 GENERAL:

A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

B. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide one electronic copy of the specifications (in PDF format) at the conclusion of the Project.

PART 4 - MAINTENANCE OF RECORD DOCUMENTS

4.01 GENERAL

A. Contractor shall store Record Documents apart from documents used for construction as follows:

(1) Provide files and racks for storage of Record Documents.

(2) Maintain Record Documents in a clean, dry, legible condition and in good order.

B. Contractor shall not use Record Documents for construction purposes.

PART 5 – PRODUCTS Not Used.

END OF DOCUMENT

ELECTRICAL ENGINEER **INTEGRAL GROUP** 427 13TH STREET OAKLAND, CA 94612 Contact: David Kaneda CA License No. E14003	Tel: (510) 663-2070	REGISTERED PROFESSIONAL ENGINEER DAVID K. KANEDA No. E 14003 Exp. 6-30-20 ELECTRICAL STATE OF CALIFORNIA STAMP
CIVIL ENGINEER **UNDERWOOD & ROSENBLUM, INC.** 1630 OAKLAND ROAD, STE A114 SAN JOSE, CA 95131 Contact: Mark E. Sorenson CA License No: C67498	Tel: (408) 453-1222 Fax: (408) 453-1207	REGISTERED PROFESSIONAL ENGINEER MARK E. SORENSON No. C 67498 Exp. 6-30-19 CIVIL STATE OF CALIFORNIA STAMP
LANDSCAPE ARCHITECT **GATES + ASSOCIATES** 2671 CROW CANYON ROAD SAN RAMON, CA 94583 Contact: David Gates CA License No: 1550	Tel: (925) 738-8176 Fax: (925) 838-8901	REGISTERED LANDSCAPE ARCHITECT DAVID GATES 6/31/2018 L.A. STATE OF CALIFORNIA STAMP

BID SET
NOT FOR
CONSTRUCTION
03/11/2019

OWNER

SOUTH SAN FRANCISCO UNIFIED SCHOOL DIST.
398 'B' STREET
SOUTH SAN FRANCISCO, CA 94080
Director of Facilities: Ronald Vose
Tel: (650) 246-5977
Fax:(650) 583-4717

ARCHITECT

H Y ARCHITECTS, INC.
300 27TH STREET, 2ND FLOOR
OAKLAND, CA 94612
Contact: Marcus Hibser
CA License: C27362
Tel: (510) 446-2222
Fax: (510) 446-2211

STAMP

STRUCTURAL ENGINEER

KAM YAN & ASSOCIATES
433 HEGENBERGER ROAD, SUITE 204
OAKLAND, CA 94621
Contact: Kam Yan
CA License No: S3312
Tel: (510) 562-0581
Fax: (510) 562-0584



STAMP

MECHANICAL ENGINEER

INTEGRAL GROUP
427 13TH STREET
OAKLAND, CA 94612
Contact: Joe Wenisch
CA License No: M36271
Tel: (510) 663-2070



STAMP

BID SET
NOT FOR
CONSTRUCTION
03/11/2019

SECTION 02 41 19
MINOR DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal of designated building equipment and fixtures.

B. Removal of designated construction.

C. Disposal of materials.

D. Cap and identify utilities.

E. Temporary partitions to allow building occupancy.

F. Schedule of materials and equipment.

G. Temporary fire protection.

H. Coordination with hazardous waste removal.

1.2 PROJECT RECORD DOCUMENTS

A. Submit record drawings under provisions of DIVISION 1.

B. Accurately record locations of capped utilities, subsurface and obstructions.

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition Work, safety of structure, electrical disconnection and reconnection, dust control and disposal of materials.

B. Comply with 2016 California Fire Code (CFC), California Code of Regulations, (CCR) Title 24, Part 9, Chapter 33 - Fire Safety During Construction and Demolition.

C. Obtain required permits from authorities.

D. Notify affected utility companies before starting Work and comply with their requirements.

E. Do not close or obstruct egress width to exits.

F. Do not disable or disrupt building fire or life safety systems without 10 days prior written notice to the District.

G. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.4 SEQUENCING

A. Sequence Work under the provisions of DIVISION 1 SUMMARY OF WORK.

1.5 SCHEDULING

A. Schedule Work under provisions of DIVISION 1.

B. Schedule Work to coincide with new construction.

C. Describe demolition removal procedures and schedule.

D. Perform Work during normal hours of operations. Refer to DIVISION 1.

1.6 PROJECT CONDITIONS

A. Areas of buildings to be demolished will be evacuated and their use discontinued before start of Work.

B. District will occupy building(s) adjacent to demolition area. Conduct demolition so District's operation will not be disrupted.

C. Provide at least 72 hours notice to District of activities that will affect District's operation.

D. Maintain access to existing walkways, exits and other adjacent occupied facilities.

E. District assumes no responsibility for areas of buildings to be demolished.

F. Hazardous Materials: It is not anticipated that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb. Notify Architect.

2. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Correlate existing conditions with requirements indicated.

B. Inventory and record conditions of items to be removed and salvaged.

C. Execute pre-demolition photographs.

D. Verify that hazardous waste remediation is complete.

3.2 PREPARATION

A. Erect and maintain weatherproof closures for exterior openings.

B. Erect and maintain temporary partitions to prevent spread of dust, fumes, noise, and smoke to provide for District occupancy as specified in DIVISION 1.

C. Protect existing items which are not indicated to be altered.

3.3 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent and occupied building areas.

B. Cease operations immediately if structure appears to be in danger. Notify Architect. Do not resume operations until directed.

C. Maintain protected egress and access to the Work.

D. Maintain fire safety during demolition in accordance with CFC Chapter 33 FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION.

3.4 EROSION AND SEDIMENTATION CONTROL

A. Inspect, repair, and maintain erosion and sedimentation control measures during clearing operations.

3.5 DEMOLITION

A. Disconnect, remove, cap and identify designated utilities within demolition areas.

B. Salvaged Items: Clean, pack, and identify items for storage or delivery to District.

C. Demolish in an orderly and careful manner. Protect existing supporting structural members.

D. Except where noted otherwise, remove demolished materials from site. Do not burn or bury materials on site.

E. Remove demolished materials from site as Work progresses. Upon completion of Work, leave areas in clean condition.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items to remain, remove all demolished materials from site and dispose in an EPA approved landfill.

B. Do not burn or bury materials on site.

3.7 SCHEDULES

A. Not Used.

END OF SECTION 02 41 19

SECTION 03 10 00
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Includes: Provision of formwork for cast-in-place concrete and installation of embedded items.

1.2 REFERENCES

A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.

B. Published specification, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).

1. California Code of Regulations. Title 24, 2016 edition, also known as California Building Code (CBC).

2. American Society for Testing and Materials (ASTM).

3. Federal Specifications (FS).

4. American Concrete Institute's "Recommended Practice for Concrete Formwork," (ACI 347).

5. United States Voluntary Product Standard for Construction and Industrial Plywood (PS 1).

6. American Plywood Association's "Guide to Plywood Grades" (APA).

7. West Coast Lumber Inspection Bureau's "Standard Grading Rules No. 17" (WCLIB).

1.3 QUALITY ASSURANCE

A. Design Criteria: Formwork shall conform to ACI 347 and CBC Section 1906A.

1. Formwork:

a. Shall prevent leakage or washing out of cement mortar.

b. Shall resist spread, shifting, and settling.

c. Shall reproduce accurately required lines, grades, and surfaces within tolerances specified.

2. Safety: The Contractor shall be responsible for adequate strength and safety of all formwork including false work and shoring.

B. Allowable Tolerances: Formwork shall produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.

1.4 SUBMITTALS

A. Samples: Only as requested by the Architect.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

1.6 JOB CONDITIONS

A. Sequencing Schedule:

1. Ensure timely delivery of embedded items. Be responsible for cutting and patching necessitated by failure to place embedded items.

2. Plan erection and removal to permit proper sequence of concrete placing without damage to concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forming Materials:

1. Panel or board forms at the Contractor's option.

a. Panel Forms: Minimum 5/8-inch thick exterior grade plywood with sealed edges, PS 1 grade Ply form Class I and II B-B Exterior or HDO Exterior.

b. Board Forms: Shiplap or tongue and groove lined with PS 1 grade Ply form Class I and II Exterior ½-inch or HDO Exterior ½-inch or 3/16-inch thick fiberboard conforming to FS LLL-B-810a(1), type I.

2. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.

a. Use Plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, with each piece bearing legible inspection trademark. Panels to receive specified form sealer to ensure uniform finish of exposed surfaces.

b. Designated "Architectural Concrete" Surfaces: Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class 1.

3. Pan Joist forms: Provide removable forms, Coco Corporation or equal. Forms shall have adequate strength to maintain their shape during placing of concrete and shall permit easy removal without damage to concrete surfaces. Forms shall be true to shape, free from bulges, tears or other damage, and shall be free from oil, grease, paint, dirt or other deleterious coatings. Forms shall fit close, tight and straight. Forms shall be cleaned up before reuse.

4. Chamfer Strips: Burke Concrete Accessories' PVC type CSF ½-inch, all exposed corners.

5. Columns Forms: SONOTUBE or equal, and as required for other configurations.

B. Wood Framing: WCLIB standard grade or better Douglas fir.

C. Form Ties and Spreaders: Metal type acting as spreaders, leaving no metal within one inch of concrete face and no fractures, spalls, depressions or other surface disfigurations greater than 3/4-inch in diameter.

D. Expansion Joint Filler:

1. Fiber Type: Premolded asphalt-impregnated fiber, ASTM D1751, 1/4-inch thick unless otherwise noted. Same as W. R. Meadows, Inc.'s "Sealtight Fiber Expansion Joint"; Grace Construction Materials "Serviced Fiber Expansion Joint Filler, Code 1390"; National Expansion Joint Co.'s "Fiber Joint Filler No. 12"; Burke Concrete Accessories, Inc.'s "Burke Fiber Expansion Joint"; or equal product substituted per Section 01630.
2. Cork Type: Preformed cork, ASTM D1752, Type II, 1/4-inch size unless otherwise noted. Same as W. R. Meadows, Inc.'s "Sealtight Cork Expansion Joint"; Sonneborn-Contech's "Sonoflex Cork"; Grace Construction Materials' "Serviced Standard Cork Expansion Joint Filler, Code 4323; or equal product substituted per Section 01630.

E. Form Sealer: Same as Grace Construction Material's "Formfilm"; or equal product substituted per Section 01630.

F. Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. Same as The Nox-Crete Co.'s "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex;" or equal product substituted per Section 01630.

G. Foam Board: Extruded close cell polystyrene foam, channeled for drainage, with a minimum compressive strength of 60 psi at 0.1-inch deformation when tested in accordance with ASTM D1621-73, and meeting requirements of FS-HH-I-524b, Type II, Class B. Same as The Dow Chemical Co.'s "Styroform PD Brand" or equal product substituted per Section 01630.

2.2 SOURCE QUALITY CONTROL

A. Plywood shall bear APA grade-trademark.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where formwork will be constructed and verify that:

1. Excavations are sufficient to permit placement, inspection and removal of forms.

2. Excavations for earth forms have been neatly and accurately cut.

3. Conditions are otherwise proper for formwork construction.

B. Do not start work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Obtain necessary information for coordination of formwork with items to be embedded in concrete and other related work.

3.3 CONSTRUCTION

A. General:

1. Design, erect, support, brace and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 347.

2. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb Work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in Work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

3. Frame openings where indicated on Architectural, Structural, Mechanical, Plumbing and Electrical drawings.

B. Earth Forms:

1. Construct wood edge strips at top sides of excavations.

2. Provide forms for footings wherever concrete cannot be placed against solid

earth excavation.

3. Remove loose dirt and debris prior to concrete pours.

4. Foundation concrete may be placed directly into neat excavations provided the foundation trench walls are stable as determined by the Architect (Structural Engineer), subject to the approval of DSA. In such case, minimum formwork shown on the drawings is mandatory to insure clean excavations immediately prior to and during the placing of concrete.

C. Walls and Other Formed Elements:

1. Erect outside forms for exposed exterior walls first and obtain the Architect's approval before reinforcement is placed. Obtain Architect's approval of the reinforcement before interior form is erected.

2. Carefully align inside and outside forms before tightening ties.

3. Plywood Forms: Insure vertical joints are plumb and horizontal joints are level; arrange joints and ties in geometrical pattern as approved by the Architect.

4. Form inside corners at exposed conditions with mitered boards or plywood so that no concrete is placed against form ends.

5. After erection, seal all cracks, holes, slits, gaps, and apertures in forms so that they will withstand the pressure and will remain completely watertight.

6. Provide a means to seal the bottom of forms at construction joints such as foam tape or other gasket devices.

7. Apply a coating of release agent prior to the erection of formwork. Follow approved manufacturer's recommendations.

D. Slab Forms:

1. Establish levels and set screeds.

2. Depress slabs where required to receive special floor finishes.

E. Beam or Joist Forms:

1. Provide cambers as noted on Contract Drawings.

F. Cleanouts and Openings: Provide on interior face of wall forms as required for effective removal of loose dirt, debris and waste material, for inspection of reinforcing and for introduction of vibrators where the Architect deems necessary.

G. Expansion Joints:

1. Provide in exterior concrete paving on grade at maximum 24-feet on center

or as noted and at intersections with vertical surfaces, curbs, manholes or other penetrations through paving.

2. Use fiber type expansion joint fillers typically and depress 1/4-inch unless otherwise noted.

3. Use cork type expansion joint fillers at conditions with non-bituminous waterproofing, liquid waterproofing or sealant systems.

H. Construction Joints:

1. Provide where shown on the drawings as directed by the Architect and per CBC requirements

2. Provide key indentations at all joints.

3. Provide pour strips on inside face of forms at horizontal joints, but remove strips and thoroughly clean out reglets before placing subsequent portions of wall.

4. Prevent formations of shoulders and ledges.

5. Provide means for drawing forms into firm contact with concrete before placing additional concrete over previous pours where shrinking and warping has separated concrete from forms.

I. Embedded Items:

1. Properly locate, unless locating is specified elsewhere, and place inserts and embedded items required by other trades prior to casting concrete.

J. Shoring and underpinning:

1. Adequately brace and maintain shoring to safely support vertical, lateral, and asymmetrical loads until completed structure has attained design strength or 14 days, whichever is greater.

2. Distribute shoring loads over area where shoring is erected and protect against undermining or settlement.

3. Provide means for making vertical adjustments to compensate for settlement either before or during placing of concrete.

4. Construct shores for soffits of beams to permit removal of forms without removing shores.

5. Re-shoring will be permitted. Shores and re-shores shall be designed by a structural Engineer registered in the State of California and installed under his/her direction. The structural Engineer shall be employed by the Contractor.

3.4 REMOVAL

A. Secure the Architect's approval for time and sequence of form removal.

B. Form Removal: Forms shall be removed without damage to the concrete, and in no case shall they be removed prior to the concrete member attaining the specified strength.

*Estimated curing time required to obtain desired strength. Results of the 7-day test cylinder break shall be presented to the Architect to demonstrate compliance with above specified strength requirements prior to form removal. If a 7-day test cylinder break demonstrates strength that is less than that specified, the Contractor may elect to take additional cylinders at the time of next pour to demonstrate strength requirements. The Contractor shall bear the cost of taking and testing the additional samples.

C. Forms:

1. Remove forms carefully to avoid damaging corners and edges of exposed concrete.

2. Reuse:

a. The Architect will approve reuse of forms provided they are straight, clean, free from nails, dirt, hardened concrete, or other injurious matter and edges and surfaces are in good condition.

b. Clean and repair any damage caused by placing, removal, or storage. Reuse of formwork with repairs or patches which would result in adverse effects to architectural concrete finish will not be permitted.

c. Store formwork in manner to prevent damage or distortion.

d. Reseal as required to achieve concrete of specified quality.

D. Shoring and Re-shoring

1. Two levels of shoring or one level of shores over one level of re-shores shall be maintained below any newly cast level until it has attained design strength and is at least 28-days old.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section Includes: Provision of reinforcement for all concrete unless specifically noted otherwise.

1.2 REFERENCES

A. Requirements of the GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).

1. California Code of Regulations. Title 24, 2016 edition, also known as California Building Code (CBC).

2. American Society for Testing and Materials (ASTM).

3. American Concrete Institute's:

a. "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315).

b. "Building Code Requirements for Reinforced Concrete" (ACI 318-14).

4. Concrete Reinforcing Steel Institute (CRSI):

a. "Manual of Standard Practice."

b. "Recommended Practice for Placing Reinforcing Bars."

5. American Welding Society's:

a. "Mild Steel Covered Arc-Welding Electrodes": (AWS A5.1).

b. "Reinforcing Steel Welding Code: (AWS D1.4).

1.3 QUALITY ASSURANCE

A. Welders' Qualifications: Welders shall be qualified in accordance with AWS D1.4.

B. Reinforcing steel shall not be permitted to rust where there is danger of staining exposed surfaces of adjacent concrete. The Contractor shall replace rust-stained concrete at his expense.

C. Allowable Tolerances: Reinforcing steel shall be placed within tolerances permitted by CBC, Section 1907A.5 unless otherwise approved by the Architect.

D. The Owner's Testing Agency will provide tests in accordance with CBC requirements.

1. Collect mill test reports for reinforcement.

2. Take samples from bundles at fabricators.

a. When bundles are identified by heat number and accompanied by mill analysis, two specimens shall be taken from each ten (10) tons, or fraction thereof, of each size and grade.

b. When reinforcement is not positively identified by heat numbers or when random sampling is intended, two specimens shall be taken from each 2½ tons, or fraction thereof, of each size and grade.

3. Test for tensile and bending strengths.

4. Provide inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification in accordance with AWS D1.4 and UBC Standard No.19-1. Chemical analysis sufficient to determine carbon equivalent and minimum preheat temperature shall be performed when reinforcement does not conform to low-alloy steel requirements of CBC Section 1903A.5.2.

1.4 SUBMITTALS

A. Shop Drawings: Show bending and placing details, size and location of reinforcing steel. Include diagrammatic wall elevations at 1/4-inch equals one foot scale to clearly show position and erection marks of bars including marginal bars around openings with dowels, splices, etc.

B. Certified mill test reports (tensile and bending) for each heat or melt of steel prior to delivery of material to the job site. Where reinforcing is to be welded, mill test reports shall verify the weldability of the steel.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement and accessories to site not more than 48-hours before placement.

B. Store in manner to prevent excessive rusting and fouling with grease, dirt, or other bond-weakening coatings.

C. Take precautions to maintain identification after bundles are broken.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bars: New billet steel, ASTM A615 Grade 60, ASTM A706, or ASTM A615, Grade 60, designation S1.

B. Tie Wires and Spirals: ASTM A82.

C. Welded Wire Fabric: ASTM A185.

D. Welding Electrodes: Mild steel covered arc-welding types conforming to AWS A5.1.

E. Bar Supports: As required for assembling and supporting reinforcement in place.

1. Typical: CRSI Class B pregalvanized.

2. Interior and Exterior Soffits and Other Exposed Conditions: CRSI Class C plastic-protected; or class E stainless steel wire, Type 430, and containing not less than 16-percent chromium.

F. Threaded coupler: Lenton Standard coupler by ERICO or equal product substituted per Section 01630. Coupler shall develop 125-percent of specified yield strength reinforcement.

2.2 FABRICATION

A. Shop-fabricate to comply with drawings.

B. Conform to requirements of ACI 315 where specific details are not shown or where drawings and specifications are not more demanding.

PART 3 - EXECUTION

3.1 PLACEMENT

A. General:

1. Place bars as noted.

2. All reinforcement shall be continuous. See drawings for lap splice schedule. Stagger splices where possible. Contact lap splices shall be securely wired together to maintain alignment.

3. Ensure placement will permit concrete protection in conformance with CRSI or to extent shown.

4. Support and fasten bars securely with spacers, chairs or ties to permit their being walked upon without displacement or movement both before and during placement of concrete. Wire-tie bar intersections.

5. Do not bend bars around openings or sleeves. Wherever conduits, piping, inserts, sleeves, etc. interfere with placing of reinforcement, obtain the Architect's approval of placing before concreting.

6. Do not field bend bars unless expressly noted in the Contract Documents.

B. Reinforcement for Shotcrete Applications:

1. Place reinforcement in accordance with CBC requirements.

C. Welding:

1. Employ shielded metal-arc method and conform to AWS D1.4.

2. Ensure equipment supplies proper current and voltage and is adjustable to suit arrangement and thickness of items welded.

D. Prior to placing concrete, verify reinforcement has been bent, positioned, and secured in accordance with drawings; ensure removal of oil, grease, dirt, or other bond-weakening coatings; replace severely rust-pitted reinforcing bars.

E. Quality Assurance:

1. The Project Inspector will inspect placement of reinforcement and notify Structural Engineer of any discrepancies in placement.

2. The Owner's Testing Agency will inspect shop and field welding of reinforcing bars in accordance with CBC requirements.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section Includes: Provision of cast-in-place concrete unless specifically noted otherwise.

1.2 REFERENCES

A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).

1. California Code of Regulations. 2016 edition, also known as California Building Code (CBC).

2. American Society for Testing and Materials (ASTM).

3. American Concrete Institute's:

a. "Specification for Structural Concrete for Buildings" (ACI 301).

b. "Recommended Practice for Cold Weather Concreting"(ACI 306).

c. "Recommended Practice for Hot Weather Concreting"(ACI 305).

d. "Recommended Practice for Measuring, Mixing and Placing Concrete" (ACI 304).

e. "Building Code Requirements for Reinforced Concrete" (ACI 318-14).

4. State of California, Business and Transportation Agency Division of Highways' "Materials Manual," (CMM).

1.3 QUALITY ASSURANCE

A. The Contractor's Testing Laboratory Qualifications: The Contractor's Testing Laboratory shall be under direction of a Civil Engineer registered in the State of California, shall have operated successfully for four years prior to this work, and shall conform to requirements of ASTM E329.

B. Requirements of ACI 301 shall govern work, materials and equipment related to this Section; specifications herein set minimum results required, and references to procedures are intended to establish minimal guides.

C. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements.

D. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that:

1. Specified concrete strengths will be met.

2. Equipment has a record of satisfactory performance under similar conditions and using a similar mix.

3. Trial batches have been made.

1.4 SUBMITTALS

A. The Contractor's Testing Laboratory's certificate of compliance.

B. The Contractor shall submit:

1. Certified copies of mix designs for each concrete class specified including compressive strength test reports.

2. Certification that materials meet requirements specified.

3. Samples only as requested by the Architect.

4. Certification from vendor that samples originate from and are representative of each lot proposed for use.

C. The Owner's Testing Agency will submit reports on tests and inspections performed to the Owner, the Architect, the Contractor, and the Division of the State Architect.

D. Shop Drawings: Show construction joint locations and details.

E. Schedule of placing for the Architect's review before starting Work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ensure storage facilities are weather tight and dry.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

C. Store bulk cement in bins capable of preventing exposure to moisture.

D. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

PART 2 - PRODUCTS

2.1 CONCRETE CLASSES

CLASS	STRENGTH	AGGREGATE	WEIGHT	SLUMP	W/C (By Weight)
A	3000	3/4	145	4	0.45
B	3000	3/4	110	4	0.48
C	4000	3/4	145	4	0.48

A. Class:

1. Use Class "A" concrete for columns, walls, slabs and beams above grade, footing, stair treads and all other areas unless noted otherwise.

2. Use Class "B" for concrete topping over metal decks.

3. not used

B. Strength: Compressive strength in psi after 28-days when tested in accordance with ASTM C39. All concrete shall develop compression strength specified in 28-days. To meet above requirements, mix shall be designed such that average compressive strength will exceed specified 28-day strength by an amount as specified by ACI 318.

C. Aggregate: Maximum size in inches.

D. Weight: Pounds per cubic foot, air dry.

E. Slump: In inches when tested in accordance with ASTM C143.

F. W/C: Water-cement ratio.

2.2 MATERIALS

A. General Requirements:

1. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged through-out work unless the Architect approves request for change made at least 10-days prior to anticipated date of casting.

2. Ready-mixed concrete shall meet requirements of ASTM C94.

3. Deviations in properties of materials tested by the Owner's Testing Agency shall be cause for their rejection pending additional test results and redesign of mix by the Contractor's Testing Laboratory.

4. No frozen aggregates will be permitted.

B. Cements:

1. For Class A and B Concrete: ASTM C150, Type II. Use one brand of cement throughout project unless otherwise acceptable to Architect.

C. Fly Ash: ASTM C618, Type F, max. of 25%.

D. Aggregates:

1. Coarse: ASTM C33. Coarse aggregate shall consist of a clean, hard, fine grained, sound crushed rock, or washed gravel or a combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than two percent by weight of shale or cherty material. "Cleanness value shall not be less than 75 when tested per MM Test Method, 227 and conforming to CBC Section 1903A.3.2.

2. Fines: ASTM C33. Sand equivalent shall be not less than 75 when tested as per ASTM D2419.

3. Light weight aggregate C330.

4. Provide aggregates from a single source for exposed concrete.

E. Water: Clean and potable, free from impurities detrimental to concrete.

F. Water-Reducing Admixture: ASTM C494, Type A, non-lignini sulfonate. Same as Grace Construction Materials' "WRDA with Hycol"; Master Builders "Pozzolith 322N"; Sika Corp.'s "Plastocrete 161"; or equal product substituted per Section 01630.

1. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other products. Same as W.R. Grace's "Daravair", Master Builders' "Micro-Air", Sika Corp.'s "Sika Aer", or equal product substituted per Section 01630.

2. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G. Same as W.R. Grace's "WRDA 19", Master Builders' "Rheobuild", Sika Corp.'s "Sikament", or equal product substituted per Section 01630.

3. Water Reducing, Accelerator Admixture: ASTM C494, Type E. Same as W.R. Grace's "Daraset", Master Builder's "Pozzutec 20", Euclid's "Accelgurad 80", or equal product substituted per Section 01630.

4. Water Reducing, Retarding Admixture: ASTM C494, Type D. Same as W.R. Grace's "Daratard-17", Master Builders' "Pozzoliith R", Sika's "Plastiment", or equal product substituted per Section 01630.

5. Fibrous Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs. Same as W.R. Grace's "Grace Fibers", Euclid's "Fiberstrand 100", Fibermesh's "Fibermesh", or equal product substituted per Section 01630.

G. Other Admixtures: Only as approved by the Architect.

H. Wax Sealer: Heavy penetrating type as manufactured by approved manufacturer of clear hardener.

I. Abrasive Grains: Aluminum oxide type. Same as Sonneborn-Contech's "Frictex NS"; General Abrasive Co., Inc.'s "Fut-Sure"; The Exolon Co.'s "Exolon Anti-Slip"; or equal product substituted per Section 01630.

J. Non-Shrink Grout: Premixed high strength grout requiring only addition of water at the site. Same as Master Builder's "Masterflow 928 Grout"; Burke's "Non-Ferrous, Non-Shrink Grout", or equal product substituted per Section 01630.

K. Curing Materials:

1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Sisalkraft Division of St. Regis Paper Co.'s "Orange Label"; or equal product substituted per Section 01630.

2. Sheet Plastic: Polyethylene, four mils thick, fungus-resistant.

3. Curing Compound: ASTM C309. Same as Grace Construction Materials' "Horn Clear Seal"; Grimes Co.'s "Sealcrete"; Master Builders' "Masterseal W", or equal product substituted per Section 01630.

L. Concrete Sealer: Clear water repellent treatment, blend of six resins containing no silicones or stearates, no darkening or change of color. Same as Sonneborn-Contech's "White Rox M-6-50-8"; Tamms Industries' "Chemstop"' or equal product substituted per Section 01630.

M. Hardener, Clear Liquit Type: Grace construction Materials' "Hornstone Crystal Chemical Hardener"; Master Builder's "Mastercron"; Sonneborn-Contech's "Lapidolith"; Upco Co.'s "Vitrox 4701"; or equal product substituted per Section 01630.

N. Epoxy Adhesive: Two component materials suitable for anchoring rebar into dry or damp concrete. Same as Hilti HIT-RE 500-SD (ICC ESR-2322) or equal product substituted per Section 01630.

2.3 MIXES

A. General Requirements:

1. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.

2. For each mix submit data showing that proposed mix will attain the required strength in accordance with requirements of CBC Section 1905A.3.

3. The Contractor shall instruct Laboratory to base mix design on use of materials tested and approved by the Owner's Testing Agency.

4. Mix shall be designed, tested, and adjusted if necessary in ample time before first concrete is scheduled to be placed. Laboratory data and strength test results for revised mix design shall be submitted to Architect prior to using in project.

5. Insure mix designs will produce concrete to strengths specified and of uniform density without segregation.

6. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard without changing cement content.

7. The Contractor's mix designs shall be subject to review by the Architect and by the Owner's Testing Agency.

8. Introduction of calcium chloride will not be permitted.

9. Unspecified admixtures will not be permitted unless the Architect reviews, the Contractor modifies mix designs as necessary, and modifications are accepted by the Owner's Testing Agency.

B. Slab-on-Grade Mix requirements

1. Maximum water/cement ratio of 0.45.

2. Maximum fly ash content of 25% (as percentage replacement of cement).

3. Do not use air entrainment additives.

4. Use of Water-Reducing admixture is required. High Range Water-Reducing admixture (super platicizer) shall be used when required to maintain workability and pumpability.

C. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand.

D. Concrete Fill at Stairs: Mix in proportions by volume of one part cement, two parts fine aggregate, one part coarse aggregate (3/8- inch); with as little water as necessary to make stiff workable plastic mix.

E. Non-Shrink Grout: Follow approved manufacturer's printed instructions and recommendations.

2.4 MIXING

A. Batching Plant Conditions:

1. Ensure equipment and plant will afford accurate weighing, minimize segregation and will efficiently handle all materials to satisfaction of the Architect and the Owner's Testing Agency.

2. Replace at no additional expense equipment the Architect and the Owner's Testing Agency deem inadequate or unsuitable.

3. Use approved moisture meter capable of determining moisture content of sand.

B. General Requirements:

1. Thoroughly clean concrete equipment before use for architectural concrete mixes to avoid contamination.

2. Mix cement, fine and coarse aggregates, admixtures and water to exact proportions of mix designs. Method of mixing shall comply with CBC Section 1905A.8.

3. Measure fine and coarse aggregates separately according to approved method which provides accurate control and easy checking.

4. Adjust grading to improve workability; do not add water unless otherwise directed.

5. Maintain proportions, values, or factors of approved mixes throughout work.

6. Mix concrete in transit mixers five minutes immediately prior to discharge in addition to mixing as called for by ACI 304 and ASTM C94.

C. Admixtures: Use automatic metering dispenser to introduce admixture into mix. Dispenser shall be recommended and calibrated by admixture manufacturer.

2.5 SOURCE QUALITY CONTROL

A. The Owner's Testing Agency will:

1. Review mix designs, certificates of compliance, and samples of materials the Contractor proposes to use.

2. Test and inspect materials, as necessary, in accordance with ACI 318 and CBC Sections 1903A and 1905A for compliance with requirements.

3. Take samples as required from the Contractor's designated sources.

4. Take one grab sample for each 100 tons of Portland cement except that, when used in bulk loading ready-mix plants where separate bins for pretested cement are not available, take grab samples for each shipment of cement placed in bin with not less than one sample being taken for each day's pour and subsequently test such samples if required by the Architect who may be so advised by Division of the State Architect.

5. Test both coarse and fine aggregate by use of solution of sodium or magnesium sulfate, or both whenever in the judgement of the Architect such tests are necessary to determine quality of material. Perform such tests in

accordance with ASTM C88. Loss shall not exceed 6-percent of either fine or coarse aggregate. Aggregate failing to comply with this requirement may be used in the Work provided it contains less than 2- percent of shale and other deleterious particles and shows a loss in soundness test of not more than 10-percent when tested in the sodium sulphate solution. Test aggregates as required by CBC Section 1903A.3.

6. Test for sand equivalent of fine aggregate in accordance with California Test 217.

7. Test for cleaness value of coarse aggregate in accordance with California Test 227.

8. Inspect plant prior to any work to verify following:

   a. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.

   b. Other plant quality controls are adequate.

9. Continuously inspect quality and quantity of materials used in transit mixed concrete, in batched aggregates and ready-mixed concrete at mixing plant or other location per CBC requirements where other materials are measured.

B. Waiver of Batch Plant Inspection:

1. Continuous batch plant inspection may be waived in accordance with CBC requirements if the plant complies with ASTM C94 and has been certified by an agency acceptable to DSA to comply with the requirements of the National Ready Mix Concrete Association.

2. When batch plant inspection is waived, the following requirements shall apply:

   a. Testing Agency shall check the first batching at the start of work and furnish mix proportions to the licensed Weighmaster.

   b. Licensed Weighmaster shall identify material quantities and certify each load by a ticket.

   c. Project Inspector shall collect truck mix tickets with load identification and maintain a daily record of placement. Trucks without a load ticket identifying the mix shall be rejected. Copies of daily placement record shall be submitted to DSA.

   d. At the end of the project, the Weighmaster shall submit an affidavit to DSA certifying that all concrete supplied conforms to proportions established by mix designs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine units of work to be cast and verify that:

1. Construction of formwork is complete.

2. Required reinforcement, inserts, and embedded items are in place.

3. Form ties at construction joints are tight.

4. Concrete-receiving places are free of debris.

5. Dampen subgrade or sand course for slabs-on-grade. Do not saturate.

6. Depths of depressed slab conditions are correct for delayed finish noted and for its proper bonding to concrete.

7. Conveying equipment is clean and properly operating.

8. The Architect has reviewed formwork and reinforcing steel and that preparations have been checked with the Project Inspector.

B. Do not begin casting before unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ensure availability of sufficient labor, equipment and materials to place concrete correctly in accordance with scheduled casting.

B. Protect finished surfaces adjacent to concrete-receiving places.

C. Clean transportation and handling equipment at frequent intervals and flush thoroughly with water before each day's run. Do not discharge wash water into concrete form.

D. Construction Joints: Clean and roughen all construction joint contact surfaces by removing all surface latence and exposing sound mortar. Sandblasting and bush-hammering are acceptable methods.

3.3 PLACING

A. The Inspector of Record, Architect, Structural Engineer, Testing Laboratory and DSA shall be notified at least 48 hours before placing concrete.

B. Place concrete in accordance with CBC Section 1905A.

C. Place concrete in cycles as a continuous operation to permit proper and thorough integration and to complete scheduled placement. Place no concrete where sun, wind, heat, or facilities prevent proper finishing and curing.

D. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing; do not deposit concrete initially set.

Cast concrete within ninety (90) minutes after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.

E. Take precautions to avoid damage to under-slab moisture barrier and displacement of reinforcement and formwork.

F. Deposit concrete vertically in its final position. Avoid free falls in excess of six feet where reinforcement will cause segregation and in typical conditions unless the Architect approves otherwise.

G. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage through forms.

H. Interruption in casting longer than 60-minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as the Architect directs; clean forms and reinforcement as necessary to receive concrete at a later time.

I. Hot Weather Concreting: Conform to ACI 305 and following requirements when mean daily temperature rises above 75 degrees Fahrenheit.

1. An upper temperature limit of concrete mixes shall be established by the Contractor for each class of concrete. Concrete temperature during placing shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints, and shall not exceed 90°F. Other project climatic conditions detrimental to concrete quality such as relative humidity, wind velocity, and solar radiation shall also be considered.

2. Trial batches of concrete for each mix design shall be made at the limiting mix temperature selected. In lieu of trial batches, compression strength test reports (20 minimum) at the limiting temperature for each proposed mix shall be submitted to the Owner's testing laboratory for review.

3. Practices to maintain concrete below maximum limiting temperature shall be in accordance with ACI 305. Concrete ingredients may be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for part of the mixing water.

4. Practices to avoid the potential problems of hot weather concreting shall be employed by the Contractor in accordance with ACI 305.

5. When the temperature of the reinforcing steel or steel deck forms is greater than 120°F, reinforcing and forms shall be sprayed with water just prior to placing the concrete.

J. Cold Weather Concreting:

1. No placement of concrete will be allowed at temperatures below 20 degrees Fahrenheit or if mean daily temperature for curing period is anticipated to be below 20 degrees Fahrenheit.

2. No concrete placement will be allowed on frozen subgrade.

3. Conform to ACI 306 and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.

   a. Reinforcement, forms or ground to receive concrete shall be completely free from frost.

   b. Concrete at time of placement for footings shall have temperature no lower than 50 degrees Fahrenheit, for all other concrete this minimum temperature at time of placement shall be 60 degrees Fahrenheit. Maximum temperature shall be 90 degrees Fahrenheit.

   c. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum 7-day period after placement by means of blanket insulation, heaters, or other methods as approved by the Architect.

   d. Use of calcium chloride or admixtures containing calcium chloride as accelerators will not be permitted.

   e. The Contractor shall keep a record of concrete surface temperature for first 7-days after each pour. This record shall be open to inspection by the Architect.

K. Consolidating:

1. Use vibrators for thorough consolidation of concrete.

2. Provide vibrators for each location during simultaneous placing to ensure timely consolidation around reinforcement, embedded items and into corners of forms; ensure availability of spare vibrators in case of failures. Vibrate through full depth of freshly placed concrete.

3. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.

4. Exposed Concrete: Vibrate with rubber type heads and, in addition, spade along forms with flat strap or plate.

L. Construction Joints:

1. Verify location and conformance with typical details; provide only where designated or approved by the Architect. Comply with CBC Section 1906A.4.

2. All horizontal and vertical construction joints to be thoroughly sandblasted to clean and roughen entire surface to minimum 1/4-inch relief exposing clean coarse aggregate solidly embedded in mortar matrix.

3. Just prior to depositing concrete, the surface of the construction joint shall be

thoroughly wetted.

M. Contraction (Control) Joints in Slabs-on-Grade:

1. Construct contraction joins in slabs-on-ground to form panels of patterns indicated on Construction Drawings. Use saw cuts 1/8" x 1/4 slab depth, unless otherwise indicated.

2. Time saw cutting to allow sufficient curing of concrete to prevent ravelled or broken edges.

3. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

4. If joint pattern not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).

N. Walls and Other Formed Elements:

1. Space points of deposit to eliminate need for lateral flow. Placing procedures of concrete in forms permitting escape of mortar, or flow of concrete itself, will not be permitted.

2. Level top surface upon stopping work.

3. Take special care to fill each part of the forms by depositing concrete directly as near final position as possible, and to force concrete under and around reinforcement, embedded items, without displacement.

4. After concrete has taken its initial set, care shall be exercised to avoid jarring forms or placing any strain on ends of projecting reinforcement.

5. Where backfill is placed against a wall, it shall be adequately shored until it has attained design strength.

O. Concrete Fill at Stairs:

1. Preparation:

   a. Remove latence, mortar, oil, grease, paint, etc.

   b. Mechanically chip insufficiently rough surfaces.

   c. Remove sand, etc., with compressed air.

2. Finish stairs to profiles shown with cove at base of risers and radius at top: tool grooves at edge of treads as detailed.

3.4 CURING

A. General Requirements:

1. Take curing measures immediately after casting and for measures other than application of curing compound, extend for seven days. The Architect may recommend longer periods based upon prevailing temperature, wind and relative humidity. Comply with CBC Section 1905A.11.

2. Avoid alternate wetting and drying and fluctuations of concrete temperature.

3. Protect fresh concrete from direct rays of sun, rain, freezing, drying winds, soiling, and damage.

4. Do not permit curing method to affect adversely finishes or treatments applied to finish concrete.

B. Curing Method, Typical: Obtain the Architect's approval of alternate measures.

1. Keep forms and concrete surfaces moist during period forms are required to remain in place.

2. Apply curing compound per manufacturers' recommendations, except at slabs-on-grade apply curing compound at 150% of manufacturer's recommended application coverage rate.

3.5 CLEANING, PATCHING AND DEFECTIVE WORK

A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and, in the Architect's judgement, these defects impair proper strength or appearance of the work, the Architect will require its removal and replacement at the Contractor's expense.

B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar. Patch shall match finish of adjacent surface unless otherwise noted. Remove ledges and bulges.

C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.

D. Rock Pockets:

1. Cut out to full solid surface and form key.

2. Thoroughly wet before casting mortar.

3. Where the Architect deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, key and pack solid with concrete to produce firm bond and match adjacent surface.

E. Cleaning

1. Insure removal of bituminous materials, form release agents, bond breakers, curing compounds if permitted and other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.

2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.

3. Patching of defective concrete requires DSA approval.

3.6 PROTECTION

A. Protect concrete from injurious action of the elements and defacement of any nature during construction operations.

B. Protect exposed corners of concrete from traffic or use which will damage them in any way.

C. Make provisions to keep all exposed concrete free from latence caused by spillage or leaking forms or other contaminants. Do not allow laitances to penetrate, stain, or harden on surfaces which have been textured.

3.7 FIELD QUALITY CONTROL

A. The Owner's Testing Agency will:

1. Perform testing in accordance with ACI 318 and CBC Section 1903A and 1905A.

2. Review concrete mix designs.

3. Inspect concrete and grout placement continuously.

4. Test concrete to control slumps according to ASTM C143.

5. Continuously monitor concrete temperature as it arrives on the site.

6. Test concrete for required compressive strength in accordance with CBC Section 1905A.6.1:

a. Make and cure three specimen cylinders according to ASTM C31 for each 50 cubic yards, or fraction thereof, of each class poured at site each day.

b. Retain one cylinder for 7-day test and two for the 28-day test.

c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.

d. Transport specimen cylinders from job to laboratory after cylinders

have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.

e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.

f. Base strength value on average of two cylinders taken for 28-day test.

7. Test and inspect materials, as necessary, in accordance with ACI 318, MM Test Method 227 (Coarse Aggregates) and MM Test Method 217 (Fine Aggregates), for compliance with requirements specified in this section.

B. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:

a. Design mix number.

b. Signature or initials of ready mix representative.

c. Time of batching.

d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.

e. Total volume of concrete in each batch.

f. Notation to indicate equipment was checked for contaminants prior to batching.

2. Pay the Owner's Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C88 and C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

3.8 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish Work or by other construction. Concrete surface shall have texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Architectural Concrete Finish: Integrally colored concrete, using specified color additive; smooth light sandblast surface.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

1. After placing slabs, plane surface to tolerances for floor flatness (FF) of 15. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of F_F18. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of FF20. Grind smooth surface defects which would telegraph through applied floor covering system.

2. Floors to receive traffic topping shall have steel trowel finish.

3. For concrete slab to receive wood flooring; finish to flatness and levelness tolerances which correspond to FF 45/FL 30 minimum overall for composite of all measured values per placement and FF 30/FL 20 minimum for any

individual floor section. Slabs which do not meet the flatness and levelness criteria shall be repaired or replaced.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Dry Shake Hardener, Wear-Resistant Finish: Provide hardened wear-resistant finish at Loading Dock floor slabs.

1. Apply dry shake materials for wear-resistant finish at rate of not less than 60 lbs. per 100 sq. ft., unless greater amount is recommended by material manufacturer.

2. Immediately following first floating operation, uniformly distribute approximately 2/3 of required weight of dry shake material over concrete surface, and embed by means of power floating. Follow floating operation with second shake application, uniformly distributing remainder of dry shake material at right angles to first application, and embed by power floating.

3. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by dry shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.10 CLEAN UP

A. Perform Work under this Section to keep affected portions of building site neat, clean, and orderly. Remove, immediately upon completion of Work under this Section, surplus materials, rubbish, and equipment associated with or used in performance. Be aware that failure to perform clean-up operations within 24 hours of notice by Architect will be considered adequate grounds for having work done by others at no added expense to the Owner.

END OF SECTION

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SECTION 03 54 16
CAST UNDERLAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Liquid applied, polymer modified cementitious self-leveling floor topping.

1.2 REFERENCES

A. ASTM C109 - Compressive Strength of Hydraulic Cement Mortars.

B. ASTM C348 - Flexural Strength of Hydraulic Cement Mortars.

C. ASTM C847 - Standard Specification for Metal Lath.

D. ASTM E84 - Test Method of Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide physical characteristics, performance criteria, product limitations, and manufacturer's mix and installation instructions.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the product specified in this Section with minimum five years documented experience.

B. Applicator: Company specializing in performing the Work of this Section with minimum five years documented experience, approved by manufacturer.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install underlayment until floor penetrations and peripheral Work are complete.

B. Maintain minimum ambient temperatures and humidity recommended by the topping manufacturer during and after installation.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ardex K-15.

B. Master Builders Topping 112.

C. UZIN NC 170 LevelStar

D. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Reinforcing Mesh: ASTM C847; 2.5 pounds per square yard expanded metal, galvanized, diamond mesh.

B. Topping: Polymer modified cementitious based mix.

C. Water: Potable and not detrimental to underlayment mix materials.

D. Primer: Manufacturer's recommended type.

E. Joint and Crack Filler: Latex based.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Mix to achieve following characteristics:

1. Tensile Bond Strength: 203 psi at 28 days.

2. Compressive Strength: 4,100 psi at 28 days minimum in accordance with ASTM C109.

3. Flexural Strength: 950-1000 psi at 28 days minimum in accordance with ASTM C348.

4. Fire Hazard Classification: Flame/Smoke rating of 0/0 in accordance with ASTM E84.

C. Mix to self-leveling consistence.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning Work.

B. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum bi-products, or other compounds detrimental to topping material bond to substrate.

3.2 PREPARATION

A. Remove substrate surface irregularities. Fill voids and joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

D. Close floor openings.

E. Staple reinforcing mesh to subfloor.

3.3 APPLICATION

A. Install topping in accordance with manufacturer's instructions.

B. Place to minimum 1/4 inch and maximum 1/2 inch thickness over moisture/vapor treated existing concrete and/or wood floor.

C. Transition to existing floor surface. Use stiff mix to slope to align with existing floor.

3.4 CURING

A. Air cure in accordance with manufacturer's instructions.

3.5 APPLICATION TOLERANCE

A. Top surface: Level to 1/16 inch in 10 feet.

3.6 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 45 00 & 01 45 29.

B. Placed material: Inspecting and testing for conformance to Specification requirements.

3.1 PROTECTION OF FINISHED WORK

A. Protect installed Work under provisions of Division 1.

B. Do not permit traffic over unprotected topping surfaces.

END OF SECTION

SECTION 03 60 00
CONCRETE TESTS AND INSPECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes: Tests and inspections for work provided under following sections:

1. Section 03200 - Reinforcement.

2. Section 03300 - Cast-In-Place Concrete.

1.2 REFERENCES

A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).

1. California Code of Regulations. Title 24, 2016 edition, also known as California Building Code (CBC).

2. American Society for Testing and Materials (ASTM).

3. American Concrete Institute's "Building Code Requirements for Reinforced Concrete" (ACI 318).

4. American Welding Society's "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction" (AWS D1.4).

5. State of California, Business and Transportation Agency, Division of Highways "Materials Manual" (MM).

1.3 SUBMITTALS

A. The Contractor shall submit:

1. Certified copies of mix designs for concrete classes A, B, and lightweight including compressive strength test reports.

2. Certification that materials meet requirements specified.

3. Samples only as requested by the Architect.

4. Certification from vendor that samples originate from and are

representative of each lot proposed for use.

B. The Owner's Testing Agency will submit reports on tests and inspections performed to the Owner, the Architect, and the Contractor.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall supply labor, transport and on-site storage facilities required by the Owner's Testing Agency for taking and preparing samples for testing.

1.5 JOB CONDITIONS

A. The Contractor shall:

1. Provide the Owner's Testing Agency with free access to places whether on or off the job site where materials are stored, proportioned, mixed or fabricated, to places where equipment is stored or serviced, and to job site during times of preparation, installation, erection, placement, curing and patching.

2. Sequencing, Scheduling: Notify the Architect in sufficient time prior to fabrication, field welding, mixing, or placement to permit testing and inspecting without delaying Work.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. The Owner's Testing Agency will:

1. Collect mill test reports for reinforcement.

2. Take samples from bundles at fabricators.

a. When bundles are identified by heat number and accompanied by mill analysis, two specimens shall be taken from each 10 tons, or fraction thereof, of each size and grade.

b. When reinforcement is not positively identified by heat numbers or when random sampling is intended, two specimens shall be taken from each 2-1/2 tons, or fraction thereof, of each size and grade.

3. Test for tensile and bending strength.

4. Provide inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification in accordance with AWS D1.4 and UBC Standard No. 26-8. Chemical analysis sufficient to determine carbon equivalent shall be performed when reinforcement does not conform to low-alloy steel requirements of Section 26.407 of UBC Standard No. 26-4.

2.2 CAST-IN-PLACE CONCRETE

A. The Owner's Testing Agency will:

1. Review mix designs, certificates of compliance, and samples of materials the Contractor proposes to use.

2. Test and inspect materials, as necessary, in accordance with ACI 318, CMM Test 217 (Coarse Aggregates) and CMM Test 227 (Fine Aggregates), for compliance with requirements specified in Section 03300, Cast-In-Place Concrete and Light Weight Concrete.

3. Take samples as required from the Contractor's designated sources.

4. Take one sample for each 100 tons of Portland cement except that, when used in bulk loading ready-mix plants where separate bins for pretested cement are not available, take grab samples for each shipment of cement placed in bin with not less than one sample being taken for each day's pour and subsequently test such samples if required by the Architect.

5. Test both coarse and fine aggregate by use of solution of sodium or magnesium sulfate, or both whenever in the judgment of the Architect such tests are necessary to determine quality of material. Perform such tests in accordance with ASTM C88. Loss shall not exceed 6-percent of either fine or coarse aggregate. Aggregate failing to comply with this requirement may be used in the Work provided it contains less than 2-percent of shale and other deleterious particles and shows a loss in soundness test of not more than 10-percent when tested in the sodium sulphate solution.

6. Inspect plant prior to any work to verify following:

   a. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.

   b. Other plant quality controls are adequate. Continuously inspect quality and quantity of materials used in transit mixed concrete, in batched aggregates and ready-mixed concrete at mixing plant or other location where materials are measured.

PART 3 - EXECUTION

3.1 REINFORCEMENT

A. The Owner's Testing Agency will:

1. Test and inspect field welds as deemed necessary.

2. Inspect placement of reinforcement for conformance with Contract Documents.

3.2 CONCRETE, CAST-IN-PLACE

A. The Owner's Testing Agency will:

1. Perform testing in accordance with ACI 318.

2. Inspect concrete placement.

3. Test concrete to control slumps according to ASTM C143.

4. Continuously monitor concrete temperature as it arrives on the site.

5. Test concrete for required compressive strength as follows:

   a. Make and cure three specimen cylinders according to ASTM C31 for each 50 cubic yards or 200 square feet of surface area, or fraction thereof, of each class poured at site each day.

   b. Retain one cylinder for 7-day test and two for 28-day test.

   c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc.; date each set; and keep accurate record of pour each set represents.

   d. Transport specimen cylinders from job to laboratory. After cylinders have cured for 24 hours on site, cover cylinders and keep them at air temperatures between 60 and 80 degrees Fahrenheit.

   e. Test specimen cylinders at age seven days and age 28 days for specified strength according to ASTM C39.

   f. Base strength value on average of two cylinders taken for 28-day test.

B. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear following information:

   a. Design mix number of the Contractor Testing Agency.

   b. Signature or initials of ready mix representative.

   c. Time of batching.

   d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.

   e. Total volume of concrete in each batch.

   f. Indication that all ingredients are as previously certified or approved for use in architectural concrete.

g. Notation to indicate equipment was checked for contaminants prior to batching.

2. Pay the Owner's Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

END OF SECTION

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SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes: Provision of structural steel as indicated on the Contract Drawings. Work includes but is not necessarily limited to the following:

1. Structural steel framing, including all structural steel shown on the structural drawings and all standard structural shapes, plates and rods shown on the Architectural, Mechanical and Electrical drawings that connect to the building structure.

2. “Formwork”, for installation of anchor bolts and other steel parts that are embedded in concrete to receive structural steel

3. “Cast in Place Concrete”, for grouting of base plates and bearing plates

4. “Steel Decking”

1.2 REFERENCES

A. Standards listed below apply where designation is cited in this Section. Where the applicable year of adoption of revision is not listed below, the latest edition applies.

B. ASTM: Standards of the American Society for Testing and Materials (ASTM) apply where designated in this Section. Use applicable year of adoption or revision as published in the 2006 “Annual Book of ASTM Standards”

C. CBC: 2016 California Building Code

D. ICC-ES Evaluation Report: Where designated in this Section, products shall have an active ICC Evaluation Service, Inc. Evaluation Report evidencing compliance with provisions of the 2015 International Building Code. Reports are available at www.Icc-es.org

E. American Institute of Steel Construction’s

1. AISC 303: Code of Standard Practice for Steel Buildings.

a. The General Conditions, Special Conditions and Division 1 shall govern in the case of conflicts and provisions of the AISC 303

2. ANSI/AISC 341: Seismic Provisions for Structural Steel Buildings.

F. American Welding Society’s

1. AWS C4.1: Criteria for Describing Oxygen-Cut Surfaces and Oxygen Cutting Surface Roughness Gauge, latest edition

2. AWS D1.1: Structural Welding Code

3. AWS D1.8: Structural Welding Code – Seismic Supplement

G. Research Council on Structural Connections'

1. RCSC Specification: Specification for Structural Joints Using ASTM A325 or A490 Bolts

H. SSPC: Latest edition of Society for Protective Coatings surface preparation and painting specifications apply where cited in this Section

1.3 QUALITY ASSURANCE

A. Steel Fabricator's Qualifications: Fabricator shall have had not less than 5 years' experience in fabrication of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects.

B. Steel Erector's Qualifications: Erector shall have had not less than 5 years' experience in erection of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects.

C. Welding Qualifications: Welding procedures, welders, and welding operations shall be qualified in accordance with AWS D1.1

1. Welders performing complete penetration beam flange-to-column welds shall be job-qualified per AWS D1.1 procedures.

2. Welders who have not performed welding for period of three or more months shall be re-qualified.

3. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.

4. The Contractor shall pay costs of certifying qualifications.

D. Welding Inspector Qualifications: All welding inspectors shall be AWS certified welding inspectors (CWI) as defined in AWS Standard and Guide for Qualification and Certification of Welding Inspectors, latest edition. Welding inspector's qualifications shall be submitted to the Structural Engineer for approval. Inspectors shall be trained and thoroughly experienced in inspecting welding operations. Comply with AWS section 6.1.3.

E. Allowable Tolerances:

1. Straightness of Structural Members:

a. Members: Meet requirements of AISC1 Section M2.7.

2. Erection Tolerances: Individual pieces shall be erected so that deviation from plumb, level, and alignment shall not exceed 1 to 500.

a. Displacement of centerline of columns adjacent to elevator shafts, from established column line, shall not be more than one inch at any point.

b. Displacement of centerline of exterior columns, from established column line, shall be not more than 1-inch inward, or 2-inches away from, building line at any point.

F. All steel shall conform to CBC requirements.

1.4 SUBMITTALS

A. Manufacturer's literature describing products.

B. Shop Drawings: Show complete information necessary for the fabrication and erection of structural-steel components in accordance with ANSI/AISC 360.

1. For members and connections that are part of the seismic Load Resisting System, conform to additional requirements of ANSI/AISC 341, Section 5.2, and Appendix W2.2
2. Identify surface preparation and finish

C. Welding:

1. Certification of Welder's Qualifications: Welders that will make welds in restricted access, such as, but not limited to, the bottom flange-to-column welds through a cope hole or access hole in the beam web, shall be qualified by the Contractor using the same welding procedure as will be used for production and a mock-up assembly that simulates the construction configuration.

2. Welding Procedure Specification: All Welding Procedure Specification (WPS) shall be submitted to the Owner's Testing Agency and the Structural Engineer for review prior to the start of the work. The WPS's shall contain the actual values to be used for the welding parameters and variables so that instruction is provided to welders. For WPS's which require qualification, Procedure Qualification Records (PQR's) shall also be submitted for review. WPS's for Flux Core Arc Welding (FCAW) shall be qualified by testing in accordance with AWS D1.1, Section 5. Production welding heat input shall be limited based on the PQR. See attached forms.

3. Weld Shrinkage and Distortion Control Plan: For highly restrained joints or where shrinkage is likely to cause problems, submit a mitigation plan to Owner's Testing Agency and the Structural Engineer for review to determine compliance with the design intent.

4. Quality Control Plan: Submit plan to Owner's Testing Agency and Structural Engineer that addresses all inspection issues, including in-process and final inspection, addressed in AWS D1.1, including sections 6.1 through 6.6, including the qualifications of the Contractor/Fabricator/Erector's Inspectors and NDE personnel.

5. Welding electrode data sheets for shop and field welding.

D. Proofs of Compliance for Materials:

1. Certification that materials meet requirements specified.

2. All steel which cannot be identified per CBC requirements as follows:

a. Certified reports of ladle analysis for all steel.

b. Certified reports of tensile, elongation, and bend tests.

E. Samples: Provide continuously as requested by the Owner's Testing Agency.

F. The Owner's Testing Agency will submit reports on test and inspections performed to the Owner, Architect, DSA and Contractor.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.

B. Discharge materials carefully; do not dump onto ground.

C. Store structural steel members, whether on or off site, above ground on platforms, skids, or other support; store other materials in weather-tight, dry place until time of use.

1.6 JOB CONDITIONS

A. Provide the Owner's Testing Agency with free access to places whether on or off job site where materials are stored or fabricated, to places where equipment is stored or serviced, and to job site during time of laying out, erection or job-site fabrication.

B. Sequencing, Scheduling:

1. Notify the Architect in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying Work.

2. Insure timely delivery of items to be embedded in work of other sections such as cast-in-place concrete; furnish setting drawings or templates and directions for installation.

PART 2- PRODUCTS

2.1 MATERIALS

A. Steel Shapes, Bars, and Plates:

1. WF: ASTM A992 as noted on drawing.

2. Channels, angles, bars, and WT Shapes: ASTM A36 as noted on drawings.

3. Plate: ASTM A36

B. Steel Tubing: ASTM A500, Grade B, Fy = 46 ksi.

C. Steel Pipe: ASTM A500, Grade C.

D. Standard Threaded Fasteners:

1. Machine Bolts and Nuts: ASTM A307, Grade A.

2. Plain Washers: ANSI B18.22.1.

3. Beveled Washers: ANSI B18.23.1.

E. 1. High Strength Bolts: One of the following, unless otherwise designated on Drawings.

a. ASTM A325, Type 1, heavy hex structural bolts with ASTM A 563, Grade C or DH heavy hex nuts and ASTM F 436 hardened washers

b. “Twist-Off “ Bolts: ASTM F1852, Type 1, round head tension control bolts with ASTM A563, Grade C or Grade DH heavy hex nuts and ASTM F436 hardened washers.

F. ASTM A307 Bolts: ASTM A307, Grade A, hex headed bolts furnished with ASTM A563, Grade A, hex nuts.

G Anchor Bolts: ASTM A307, F1554 Grade 36.

H Threaded Rods: ASTM A36.

I. Welding Electrodes: E70. The weld metal used shall be rated for Charpy V-Notch (CVN) values of 20 Ft-Lbs at a -20°F. This may be determined based on the electrode classification system, or by performing CVN tests in accordance with the AWS A5.x filler metal specifications. SMAW electrodes shall be E7018.

2.2 FABRICATION

A. General Requirements:

1. Fabricate structural steel in accordance with AISC Manual of Steel Construction; AWS D1.1 Structural Steel Welding Code, section 8, Statically

Loaded Structures, except as noted otherwise herein; and requirements of regulatory agencies.

2. Fabricate and preassemble work in shop to greatest extent possible.

3. Do shearing, flame cutting, and chipping carefully and accurately.

4. Do not drift to match misaligned holes. Where enlarging is required, ream and use larger bolt. Misaligned holes will subject members to rejection.

5. Coordinate as required for attachment of other work to structural steel.

6. Drill or punch holes for passage of reinforcing steel shapes, sections, plates, or bars as indicated on Contract Drawings. Notify architect of conditions not shown or noted.

B. Connections:

1. Shop Connections: Bolted or welded as noted.

2. Field Connections:

a. Locate field splices only where noted or approved by Architect.

b. Where connection is not shown, design in accordance with standard practices unless otherwise directed by the Architect.

c. Mark completely tightened bolts with identifying symbol.

C. Bolted Connections:

1. Punch or drill holes 1/16-inch larger than bolt size.

2. Ream unfair holes, but only up to next larger bolts size. Where unfairness exceeds maximum, weld hole in base material solid and drill hole of proper size.

3. As erection progresses, provide sufficient bolts to adequately resist dead load, lateral forces, and erection stresses.

D. Assembly with Standard Threaded Fasteners:

1. Beveled Washers: Provide under bolt heads or nuts resting surfaces exceeding five percent slope with respect to head or nut.

2. Draw up tight, check threads with chisel or provide approved lock washers or self-tightening nuts.

E. Assembly of High-Strength Structural Bolted Connections:

1. Meet requirements of RCSC and Fabrication article of this specification.

2. Connections shall be friction-type as defined in RCSC.

3. Provide hardened washers under head or nut of high strength bolts. Washer shall be provided under the element turned in the tightening procedure.

4. Provide direct tension indicator washers under the head of slip-critical high strength bolts.

F. Welded Construction: (shop and field)

1. Weld in accordance with AISC and AWS D1.1. Beam flange-to-column welds shall be made with the Shielded Metal Arc Welding (SMAW) or Flux Cored Arc Welding (FCAW) gas shielded or self shielding processes.

2. Welds that will be exposed to view on the completed Work shall be inspected and burrs, flux, welding oxide air spots, and discolorations removed. Grind, polish, or finish as specified or shown. Exterior welds shall also be watertight.

3. Butt-welds and/or Groove Welds:

a. Provide complete penetration welds.

b. If welded from one side, use back-up plates.

c. If welded from both sides, back-scarf and clean root weld before depositing weld metal from second side.

d. Preheat for minimum three inches on each side of welds; maintain interpass temperatures in accordance with ASWS D1.1.

e. Weld "dams" or "end dams" shall not be used.

f. Weld tabs (also known as weld "extension" tabs or "run off" tabs) shall be used. After the weld has been completed, the weld tabs shall be removed, the weld ground to a smooth contour, and magnetic particle tested for defects.

g. If groove weld backing (also known as "backup or backer bars") are used under the bottom beam flange-to-column complete penetration groove weld, the weld backing shall be removed, the removal area ground to sound, bright metal, and the area subjected to magnetic particle examination for defects. A reinforcing fillet weld, sized at least 1/4 of the bottom flange thickness, shall be placed in this location, but need not be greater than 3/8 inch.

h. If groove weld backing is used under the top beam flange-to-column-flange complete penetration groove weld, and is not removed, the backing shall not exceed 1/4 inch thickness and shall be attached to the column by either a fillet weld along the complete bar length on the

underside of the bar, or by a partial joint penetration groove weld from the underside of the backing for the full length of the backing. Other methods of welding the backing to the column may be used subject to the Engineer's approval.

4. Grind exposed welds smooth.

5. Column Bases: Prepare in accordance with the provision of AWS and AISC Specification M2.8.

G. Camber: Provide camber as indicated on contract drawings by mill rolling techniques or in accordance with AISC Specification M2.1.

2.3 FINISHES

A. Preparation of Surfaces:

1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from steel prior to painting.

2. Where hand-cleaning methods are not adequate, clean in accordance with SSPC-SP1, SSPC-SP 2, or SSPC-SP 7, as required.

B. Prime Painting:

1. Apply one (1) coat of primer to structural steel surfaces permanently exposed to weather.

2. Apply primer in accordance with manufacturer's specifications to provide minimum dry film thickness of 1.0 mils per coat.

3. Permit thorough drying before shipment.

4. Do not prime in temperatures lower than 45 degrees Fahrenheit.

C. Do not prime paint following surfaces:

1. Surfaces to be encased in concrete except initial 2-inches.

2. Surface to be field welded.

3. Surface to receive sprayed-on fireproofing.

4. Contact surfaces joined by high-strength bolts.

2.4 SOURCE QUALITY CONTROL

A. The Owner's Testing Agency will:

1. Review ladle analysis and certificates of compliance. Where certification is questionable, test material to verify compliance per CBC requirement.

2. Inspect shop fabrication per CBC requirement.

3. Inspect bolted connection made in the shop. Test high-strength bolts, nuts, and washers per CBC requirement.

4. Review Welding Procedure Specifications for conformance with AWS D1.1 and the electrode manufacturer's recommendations.

5. Inspect shop welding, including welding equipment, weld quality, welder certification and conformity with drawings.

6. Ultrasonic test all complete penetration welds

7. Forward copies of all product and procedure certificates, data sheets, and test reports to the Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine units of Work to be placed and verify that:

1. All anchor bolts have been installed properly.

2. Do not begin erection before unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Supervise setting of anchor bolts and other embedded items required for erection of structural steel. Ensure correct bearing of steel and correct location of anchor bolts.

3.3 ERECTION

A. General Requirements:

1. Erect structural steel in accordance with AISC Manual of Steel Construction and AWS D1.1 Structural Steel Welding Code, section 8, Statically Loaded Structures.

2. Requirements for bolted and welded connections specified in Section 2 apply to shop and field connections.

3. Ensure steel is plumb, level and aligned as specified before making final connections.

4. Leveling of base plates shall be achieved through the use of leveling nuts and anchor bolts.

5. Where erection requires performing work of fabrication on site, conform to applicable standards for fabrication.

6. Field corrections of major members will not be permitted without the Architect's prior written approval.

B. Field Assembly:

1. Clean bearing surfaces and surfaces to be in permanent contact before assembling members.

2. Accurately assemble frames to lines and elevation indicated, within erection tolerances noted.

3. Ensure assembly is plumb, level, and aligned before final connecting.

4. Do not fasten splices of compression members, before abutting surfaces have been brought completely into contact.

5. Installation of high-strength bolts shall conform to ASTM A325 for slip critical type connection in accordance with RCSC. Provide washer under head or nut of high strength bolts. Washer shall be provided under the element being turned during tightening. Bolts in welded connections shall be tensioned after completion of welding.

6. Mill scale shall be removed from the column in the area where the beam flanges will be welded to the column.

7. Flat reinforcing plates aligned parallel to the top and bottom beam flange, if used, shall be installed in accordance with these requirements: The reinforcing plate for the bottom flange shall be welded to the column in the fabricating shop using a complete joint penetration double bevel groove joint, e.g., AWS D1.1 configuration TC-U5. This weld shall be inspected by ultrasonic examination. The balance of the welding is to be done in the field. The reinforcing plate for the top flange shall be shipped loose. After the top flange has been welded to the column, and ultrasonically examined and accepted, the top flange weld surface shall be prepared, the reinforcing plate fitted for welding, the reinforcing plated welded to the column flange with a CJP single groove weld, e.g., AWS D1.1 configuration TC-U4. The reinforcing plate shall be restrained from rotation during welding to the column. After completion of the reinforcing plate to the column weld, the reinforcing plate shall be welded to the top flange.

C. Gas Cutting: Use of flame cutting torch will be permitted only after the Architect's prior written approval and only where metal cut will not carry stress during cutting, stresses will not be transmitted through flame-cut surface and cut surfaces will not be visible.

1. Make cuts smooth and regular in contour.

2. To determine effective width of members so cut, deduct 1/8-inch from least width at cut edge.

3. Make radius or re-entrance of cut fillet as large as practical, but in no case less than 1-inch.

4. Do not use flame cutting torch to align bolt holes.

D. Field Touch-Up Painting: After erection, touch-up paint field connections and abrasions resulting from the Work of this Section with same paint used for shop prime painting.

3.4 CLEANING

A. After erection, thoroughly clean surfaces of foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fireproofing concrete.

3.5 FIELD QUALITY CONTROL

A. The Owner's Testing Agency shall:

1. Re-qualify welders who will be performing complete penetration beam flange-to-column welds.

2. Inspect all field welding, including welding equipment, electrodes, weld quality, welder certification, and conformity with drawings per CBC Section 2204A.

3. Review Welding Procedure Specifications for conformance with AWS D1.1 and the electrode manufacturer's recommendations.

4. Ultrasonic test all complete penetration and partial penetration welds.

5. Provide magnetic particle inspection of weld backing removal area and fillet welds on continuity plates.

6. Inspect and test high strength bolted connections in accordance with CBC Section 2212A.

7. Bolt assemblies, which include direct tension indicators, shall be sampled and tested on a daily basis to verify proper indication of deformation with required bolt tension for each size and lot. The inspector shall have a torque wrench, calibrated daily, to verify correlation with proper tension as the installation proceeds. Test at least 10 percent of the bolts with a minimum of 2 per connection from the start of bolting and until waived by the DSA Field Engineer upon demonstration of continued good workmanship.

8. Inspect erected structural steel as required to establish conformity of Work with reviewed shop drawings and Contract Drawings.

9. Perform testing and inspection of shear connectors in accordance with requirements of AWS D1.1 and CBC 2231A.3, except that the test studs shall be subjected to a 90 bend test by striking them with a heavy hammer. After the bend test, the weld section shall not exhibit any tearing or cracking.

END OF SECTION

SECTION 05 50 00
METAL FABRICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All items of miscellaneous metal and related accessories and fasteners, including but not necessarily limited to the following:

1. Backing and mounting plates for equipment items.

2. Ceiling support system.

3. Anchor bolts.

4. Auxiliary angles brackets.

1.2 RELATED SECTIONS

A. Section 06 10 00 Rough Carpentry.

1.3 REFERENCES

A. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest additions apply).

1. 2016 California Code of Regulations, Title 24, latest edition, also known as California Building Code (CBC).

2. American Society for Testing and Materials (ASTM).

3. Federal Specifications (FS).

4. American Institute of Steel Construction's "Specification for Structural Steel Buildings."

5. American Welding Society's "Structural Welding Code" (AWS D1.1).

6. American Iron and Steel Institute's "Specifications for Design of Light Gauge Cold-Formed Stainless Steel Structural Members".

7. National Association of Architectural Metal Manufacturer's: "Metal Stairs" (NAAMM-MS).

8. Steel Structures Painting Council's "Painting Manual":

a. Solvent Cleaning (SSPCC-SP 1).

b. Hand Tool Cleaning (SSPC-SP 2).

c. Brush-Off Blast Cleaning (SSPC-SP 7).

d. Hot Phosphate Surface treatment (SSPC-PT 4).

9. American Hot Dip Galvanizers Association, Inc. (AHDGA):

a. Inspection manual for hot dip galvanized products.

1.4 QUALITY ASSURANCE

A. Welded Qualifications: Welders shall be qualified in accordance with AWS D1.1.

B. Design Criteria:

1. Work shall be designed to support normally imposed loads and conform to AISC requirements.

2. Built-up parts shall not exhibit warp.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00

B. Manufacturer's literature describing products including details and dimensions.

C. Shop Drawings:

1. Show a large scale construction of various parts, methods of joining, thickness of metals, profiles of surfaces, reinforcing, anchorage, and structural supports. Include information regarding concealed and exposed joints, welds, and fastenings.

2. Where welded connectors and concrete inserts are required to receive Work, show size and locations required.

D. Samples: Only as requested by the Architect.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.

B. Discharge materials carefully and store on clean concrete surface or raised platform in safe, dry area.

1.7 JOB CONDITIONS

A. Scheduling, Sequencing:

1. Ensure timely fabrication of items to be embedded or enclosed by other Work.

2. Furnish information and assistance required for locating embedded items and be responsible for proper locations.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND ACCESSORIES

A. Ferrous Metals:

1. Structural Steel Shapes: ASTM A36, conforming to AISC specifications.

2. Architectural and Miscellaneous Steel Items: ASTM A283.

3. Steel Sheets: ASTM A570, Grade 36.

4. Steel Pipe: ASTM A53.

5. Steel Bars: ASTM A36.

6. Steel Tubing: ASTM A500, Grade B.

7. Steel Plate: ASTM A36.

9. Zinc for Galvanizing: ASTM B06 as specified in ASTM A123.

10. Welding Electrodes: E-70XX.

11. Grout: Embeco "636" or approved equal.

B. Fastenings:

1. Typical Unfinished Bolts, Nuts, and Washers: Low carbon steel standard fasteners, externally and internally threaded, ASTM A307 Grade A; malleable washers.

2. Expansion Bolts: FS FF-S-325, Group II, Type 4. Same as Hilti's "Kwik-Bolt II Concrete Anchors"; Wej-It Expansion Products, Inc.'s "Wej-It Concrete Anchors"; or approved equal.

C. Primer: Zinc-chromate type. Same as manufactured by Fuller-O'Brien Corp.'s Ne. 121-00; The Glidden Co.'s No. 4570; Sinclair Paint Co.'s 20; or approved equal.

2.2 SPECIALTY FABRICATED PRODUCTS

A. Preparation:

1. Coordinate with other Work supporting or adjoining miscellaneous metal and verify requirements of cutting out, fitting, and attaching.

2. Verify sizes, designs, and locations of items; do so at site whenever construction progress permits.

B. General Requirements:

1. Fabricate items from materials noted and make true to profiles shown. Obtain the Architect's approval of proposed variations.

2. Miter corners and angles of frames and moldings unless otherwise noted.

3. Perform cutting, shearing, drilling, punching, threading, tapping as required for items or their adjacent Work.

4. Drill or punch holes; do not use cutting torch.

5. Ensure shearing and punching leaves true lines and surfaces.

6. Items to be Galvanized: Fabricate in accordance with recommended practices of ASTM A385 and A386 unless specifically noted otherwise.

7. Fabricate exterior items for assembly and installation on site without field-welding of joint.

8. Ensure metal thickness and assembly details provide ample strength and stiffness.

9. Size sleeves for approximately 1/4-inch clearance all around.

C. Fastening:

1. Provide fasteners and anchor assemblies required for complete fabrication, field assembly, and erection.

2. Conceal fastenings wherever practicable.

3. Size internally threaded diameters to accommodate galvanized threaded bolts where galvanizing is required.

4. Permanent Connections in Ferrous Metal Items: Employ welding wherever practicable; avoid bolts and screws.

D. Welding:

1. Use electric shielded-arc process according to AWS D1.1.

2. Maintain shape and profile of item welded.

3. Prevent heat blisters, run-throughs, and surface distortions.

4. Welds Normally Exposed to View in Finished Work: Make uniform and grind smooth.

5. Exposed Welds: Remove burrs, flux, welding oxide, air spots and discoloration; grind smooth, polish, or otherwise finish to match material welded.

E. Bolted and Screwed Connections:

1. Use bolts for field connections only, and then only as noted. Countersink heads; finish smooth and flush.

   a. Provide washers under heads and nuts bearing on wood.

   b. Draw nuts tight and prevent loosening of permanent connections by nicking threads.

   c. Use beveled washers where bearing is on sloped surfaces.

2. Where necessary to use screws for permanent connections in ferrous metal, use flat head type, countersink, fill screw slots, and finish smooth and flush.

3. Evenly space exposed heads.

2.3 FINISHES

A. Preparations of Surfaces:

1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from ferrous metal prior to galvanizing, hot phosphate treatment or painting.

2. Where hand cleaning methods are not adequate, clean in accordance with SSPC-SP 1, SSPC-SP 2, or SSPC-SP 7 as required.

3. Completely eliminate burrs, rough spots and pitting from normally exposed ferrous metal items.

B. Galvanizing:

1. Galvanize items after fabrication in largest sections practicable unless otherwise permitted or recommended by ASTM A 384 and A385.

2. Where galvanizing is removed by welding or other assembly procedures, touch up abraded areas with molten zinc or zinc-rich paint.

3. Where ferrous metal item is noted to be galvanized, perform galvanizing in accordance with following standards as applicable to item:

a. Hardware items Including Fasteners: ASTM A153.

b. Items Both under 1/8-inch Thickness and Fabricated from Rolled, Pressed, and Forged Shapes, Plates, Bars, and Strips: ASTM A383.

c. Other Fabricated items: ASTM A123.

C. Finish Schedule: Unless noted otherwise in Materials or Standard Catalog Products Articles.

1. Ferrous Metal, Interior Items:

a. Concealed: Clean, chemically etch, and shop-apply one prime-coat.

b. Exposed: Clean, treat with hot phosphate, chemically etch, and shop-apply one prime-coat.

2. Ferrous Metal, Exterior Items:

a. Concealed: Clean and hot-dip galvanize in accordance with galvanizing standards.

b. Exposed: Clean, then hot-dip galvanize in accordance with galvanizing standards, chemically etch, and shop-apply one prime-coat.

3. Special Ferrous Metal Items as Noted Below: Clean and hot-dip galvanize in accordance with galvanizing standards. Do not prime coat.

a. Miscellaneous metal items such as stairs and railings.

4. Items Noted as Chrome-Plated: Same as US26D finish.

5. Hardware Including Fasteners (Bolts, Nuts, Washers, Etc.):

a. Finish to match items fastened.

b. Where galvanizing is required, hot-dip galvanize according to ASTM A153.

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections: The Owner will employ testing laboratory to test welds per CBC, Section 2213A.1.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive Work and verify that setting conditions and dimensions are correct to receive items.

B. Do not start installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install Work plumb, true, rigid, and neatly trimmed out.

B. Do not tighten fastener through finish alone without spacer washers.

C. Provide concrete inserts or predrilled expansion bolts in fastening items into concrete.

D. Protect dissimilar metals from contact with each other or with other materials causing corrosion.

E. Fasten Work tightly to prevent rattle or vibration except where expansion-contraction tolerances are required.

F. Use nonshrink grout mixed in accordance with manufacturer's direction for setting frames, plates, sills, bolts and similar items.

G. Set items shown or required to be installed in sleeves with quicksetting anchor cement unless otherwise noted.

H. Protect metal from damage to surface, profile and shape.

3.3 CLEANING

A. Remove protective devices only when items will safe from other construction operations or removal is required to permit related Work.

B. Clean prime-coated items as required for finish painting.

END OF SECTION

SECTION 05 52 00
MANUFACTURED HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manufactured Steel tube handrails, balusters, and fittings.

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. ASTM A36 - Specifications for Structural Steel.

C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

E. ASTM E985 - Permanent Metal Railing Systems and Rails for Buildings.

F. AWS D1.1 - Structural Welding Code - Steel.

G. AWS D1.2 - Structural Welding Code - Aluminum.

H. AWS D1.6 - Structural Welding Code - Stainless Steel.

I. NAAMM - Metal Finishes Manual.

J. CCR - California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

K. SSPC - Steel Structures Painting Council.

1.3 DESIGN REQUIREMENTS

A. Design, engineer, fabricate and install railing assembly, wall rails, and attachments to resist force of 200 pounds applied in any direction at any point on the rail without damage or permanent set.

B. Conform to CCR, Title 24, Part 2 and ADAAG for accessibility requirements.

C. Fabricate railing assembly, wall rails, and attachments to ASTM E985 requirements.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings.

PART 2 - PRODUCTS

2.1 STEEL RAILING SYSTEM

A. Rails and Posts: ASTM A500, Grade B, 1-1/2 inch diameter steel tubing, 3/16 inch wall thickness, welded joints with steel inserts for casting in concrete.

B. Structural Plates, Shapes, and Bars: ASTM A36.

C. Fittings: Elbows, T-shapes, flanges, escutcheons; machined steel.

D. Wall Brackets: Wagner 1930R-24.

E. Splice Connectors: Steel welding collars.

F. Welding Materials: AWS D1.1.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Continuously seal joined pieces by continuous welds in accordance with AWS requirements.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Accurately form components to suit ramps, stairs and landings, to each other and to building structure.

2.3 FINISHES

A. Galvanizing: 1.25 oz/sq ft zinc coating in accordance with ASTM A123.

B. Touch-Up Primer for Galvanized Surfaces: SSPC 20.

C. Finish: Unpainted galvanized for exterior applications unless otherwise noted on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive Work.

B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates, to other trades.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors required for connecting railings to structure. Anchor railing to structure.

C. Field weld anchors as indicated on Drawings. Grind welds smooth. Touch-up welds with primer.

D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

END OF SECTION

SECTION 06 05 60
COUNTERTOPS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Laminated plastic countertops.

B. Splash panels.

C. Preparation for utilities.

1.1 RELATED SECTIONS

A. Section 06 41 16: Laminate-Clad Wood Casework.

1.3 REFERENCES

A. WI - Woodwork Institute: Manual of Millwork.

1.4 QUALITY ASSURANCE

A. Manufacture countertops in accordance with quality standards of the Manual of Millwork of the Woodwork Institute.

B. Issue WI Certified Compliance Certificate to Architect prior to delivery of countertops and provide WI Certified Compliance Labels on all countertops.

C. Provide WI Reinspection Service at the job site prior to installation. Provide to Architect a written report showing the results of the reinspection.

D. Upon completion of the installation, provide a WI Certified Compliance Certificate.

1.5 MOCK-UP

A. Prepare mock-up under provisions of Section 01 60 00.

B. Provide full size countertops of each type indicated.

C. Units will be examined to ascertain quality and conformity to WI standards.

D. Units will establish a minimum standard of quality for this Work.

E. Approved units may be used as part of the Work.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes. Provide WI Certified Compliance label on first page of each set.

C. Submit Samples of each type of countertop material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Active member of the Woodwork Institute licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this Section.

C. Substitutions: Under provisions of Section 01 25 00.

2.2 LAMINATED PLASTIC COUNTERTOPS

A. Fabricate in accordance with Section 16 of the Manual of Millwork:

1.	WI Grade:	Premium
2.	Core Thickness:	0.75 inch minimum.
3.	Laminate Thickness:	0.050 inch.
4.	Edge Covering:	Rolled.
5.	Backsplash:	Square butt.
6.	Top of Backsplash:	Waterfall.
7.	Plastic Colors and Pattern:	To be selected by Architect from Wilsonart's standard, textured, satin and woodgrain pattern finishes

2.3 CHEMICAL RESISTANT COUNTERS

A. Manurfacturer: Trespa; Trespa TopLab - scientific toplab solutions.

2.4 STAINLESS STEEL COUNTERTOPS

A. Stainless Steel: ASTM A167, Type 304, No. 4 finish, 18 gage thick.

B. Core: Particleboard, minimum 3/4 inch thick at interior and 3/4 inch pressure treated plywood at exterior pass-through countertops.

1. Pressure treat plywood with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry plywood to a maximum moisture content, of 15 percent.

2.5 HARDWARE

A. Grommets: Doug Mockett and Company, Inc. SG Series; plastic 3-1/2 inch diameter. Colors and locations as selected by Architect.

B. Countertop Support Brackets: 1/8 inch thick x 18 inch x 24 inch steel legs, 1-1/2 inch forms with six 1/4 inch mounting holes per side, 1,000 lbs minimum load support, 45 degree cut out as manufactured by A & M Hardware, Inc., or approved equal.

C. Piano Hinge for Countertop: Stanley No. 311, or approved equal.

D. Remainder of hardware required shall be as listed in Supplement No. 1 to Sections 14 and 15 of the Manual of Millwork.

2.5 FABRICATION

A. Shop assemble countertops for delivery to site in units easily handled and sized to permit passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

D. Install plastic grommets in the field in countertops as directed by the Owner's Representative and/or Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing.

B. Examine countertops for defects. Correct all defects prior to installation.

3.2 INSTALLATION

A. Install countertops in accordance with Installation of Architectural Millwork, Section 26 of the Manual of Millwork.

B. Make joints neatly, with uniform appearance.

C. Install Work plumb, level, true, and straight, with no distortions. Install with no variation in flushness of adjoining surfaces.

D. Shim as required, using concealed shims.

E. Scribe and cut to fit adjoining Work.

F. Repair damaged and defective Work to eliminate visual and functional defects; where repair is not possible, replace Work.

G. Sealant: Install sealant as specified in Section 07 92 00, as required to close any small unavoidable gaps between counter and abutting surfaces.

3.3 ADJUSTING AND CLEANING

A. Protect countertops from damage until acceptance.

B. Clean countertops with materials and equipment that will not cause damage to surfaces.

3.4 SCHEDULE

A. Each base cabinets shall receive a countertop.

B. All countertops shall be plastic laminate covered unless specifically noted otherwise.

C. Stainless steel countertops shall be as detailed on Drawings.

D. Galvanized steel countertops shall be installed where indicated.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section Includes: Provision of all lumber framing, rough hardware and blocking as indicated in the contract drawings.

1.2 REFERENCES

A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.

B. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work in this Section where cited by abbreviations noted below (latest editions apply).

1. California Code of Regulations. Title 24, 2016 edition, also known as California Building Code (CBC).

2. (APA) - American Plywood Association, "Guide to Plywood Grades".

3. (PS) - United States Product Standard, PS-1 "Construction and Industrial Plywood".

4. (UL) - Underwriters' Laboratories, Inc., "Fire Hazard Classification, FR-S".

5. (WCLIB) - West Coast Lumber Inspection Bureau, "Standard Grading Rules No. 17".

6. (WWPA) - Western Wood Products Association, "Grading Rules for Lumber".

7. (AWPA) - American Wood Preservers Association Standards.

8. (ASTM) - American Society of Testing and Materials.

1.3 SUBMITTALS

A. Shop Drawings of all specially fabricated rough hardware.

B. Certificates of compliance with standards specified.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Provide proper facilities for handling and storage of materials to prevent damage to

edges, ends, and surfaces.

B. Keep materials dry. Where necessary, stack materials off ground on level flat forms, fully protected from weather.

1.5 JOB CONDITIONS

A. Environmental Requirements: Maintain uniform moisture content of lumber at not more than 19-percent before, during, and after installation.

B. Sequencing, Scheduling: Coordinate details with other Work supporting, adjoining or fastening to rough carpentry Work.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Rough Carpentry:

1. Sills on Concrete: Foundation grade redwood or pressure treated Douglas Fir.

2. Lumber (Wood Framing): Meet requirements of following minimum grades.

Item	
Studs	D.F. No. 2
Plates	D.F. No. 2
Beams	D.F. No. 1
Joists	D.F. No. 1
Posts	D.F. No. 1
Blocking	D.F. No. 2

3. Plywood: Provide thickness, grade, and panel identification index shown on general notes and drawings.

4. All wood framing members for roof and wall framing to be certified in accordance with the Forest Stewardship Council (FSC) guidelines. Provide Certification.

B. Rough Hardware: All exterior hardware and fasteners attached to pressure treated members shall be hot-dipped galvanized.

1. Nails: Common wire, typical.

2. Powder Driven Fasteners: Tempered steel pins with special corrosion-resistant finish. Provide guide washers to accurately control penetration, maximum 3/4-inch. Accomplish fastening by low-velocity piston-driven powder-actuated tool. Pins and tool: Hilti Fastening Systems; Impex Tool Corporation; or equal product substituted per Section 01630.

3. Expansion Bolts: Reverse cone, self-wedging, expansion type, Tightening of

nut or increased tension on bolt shank shall act to force wedges outward to create positive increased resistance to withdrawal, Ramset/Read Head "Tru-Bolt", Hilti Kwik - TZ or equal product substituted per Section 01630.

4. Metal Timber Framing Connectors: Fabricate from hot-dipped galvanized steel. Connectors shall be at least 16-gauge material, 1/8-inch plate materials where welded, unless otherwise shown or specified, punched for nailing. Nails and nailing shall conform to the manufacturer's instructions, with a nail provided for each punched hole. Rough hardware are manufactured by Simpson Company or equal product substituted per Section 01630.

5. Substitutions of all hardware are subject to review by DSA.

6. Miscellaneous Hardware: Provide all common screws, bolts, fastenings, washers and nuts required to complete rough carpentry Work.

2.2 TREATMENTS

A. Fire-Retardant Treatment: Same as Koppers Co., Inc.'s "Non-Com" J.H. Baxter and Co.'s "Baco-Pyresote"; or equal product substituted per Section 01630.

B. Preservative Treatment: Furnish in accordance with AWPA.

2.3 FABRICATION

A. Preparation (Finish Carpentry):

1. Verify measurements at job site.

2. Verify details and dimensions of equipment and fixtures integral with finish carpentry for proper fit and accurate alignment.

3. Coordinate details with other work supporting, adjoining, or fastening to casework.

B. Lumber:

1. Air- or kiln-dry to maximum 19-percent moisture content, except maximum 15-percent for 2-inch lumber at time of surfacing.

2. Furnish surfaced four sides, S4S, unless otherwise noted.

3. Size to conform with rules of governing standard. Sizes shown are nominal unless otherwise noted.

C. Wood Treatments:

1. Fire-Retardant Treatment:

a. Fire-retardant treat only wood blocking supporting truss joists on steel beams.

b. Treat in accordance with AWPA C20 and approved manufacturer's recommendations.

2. Preservative Treatment:

a. Treat lumber and plywood sheathing exposed to weather.

b. Lumber: Treat in accordance with AWPA C2.

c. Plywood: Treat in accordance with AWPA C9.

d. After treatment and prior to shipping, air- or kiln-dry lumber to maximum 12-percent moisture content.

2.4 SOURCE QUALITY CONTROL

A. Lumber shall bear grade-trademark or be accompanied by certificate of compliance of appropriate grading agency.

B. Plywood shall bear APA grade-trademark.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive rough carpentry Work and verify following:

1. Completion of installation of building components to receive rough carpentry Work.

2. That surfaces are satisfactory to receive Work.

3. That spacing, direction, and details of supports are correct to accommodate installation of blocking, backing, stripping, furring and nailers.

4. That all anchor bolts and holdown bolts are properly installed.

3.2 INSTALLATION

A. Cutting: Perform all cutting, boring, and similar Work required.

B. Studs, Joists, Beams, and Posts: Install all members true to line. No wood shingle shims are permitted. Place joists with crown up; maximum 1/4-inch crown permitted.

C. Nail joints in accordance with applicable requirements of the CBC Table 2304.9.1 unless otherwise shown or specified. Predrill where nails tend to split wood.

D. Bolt holes to be 1/16-inch oversize. Threads shall not bear on wood. Use standard

malleable iron washers against wood. Carriage bolts require washers under the nut only.

E. Provide blocking, grounds, nailers, stripping, and backing as shown and as required to secure other Work.

F. Maintain 1/8-inch gap between all plywood panel edges.

G. Do not utilize plywood sheets having a width smaller than 2-feet 0-inches.

H. Plywood flooring shall be field glued with adhesives meeting APA specification AFG-01 applied in accordance with the manufacturer's recommendations. Apply continuous line of glue on joists and in groove of tongue and groove panels.

I. Where wood is cut, sawed, planed, bored or marred after preservative or fire-retardant treatment, apply two heavy brush coats of same material used in treatment.

J. Nail heads shall be driven flush with plywood surface. Overdriven nails (nails which fracture the outer ply layer) shall be replaced one for one.

K. Screws (Wood or Lag): Screws shall be screwed and not driven into place. Screw holes shall be predrilled to the same diameter and depth of shank. Holes for threaded portion shall be predrilled less than or equal to the diameter of the root of the thread. Provide standard cut washers under head of lag screws.

L. Where called out on plan, sills under bearing, exterior and shear walls shall be bedded on 1/2 inch minimum drypack or grout to obtain continuous bearing.

3.3 CLEANING AND ADJUSTING (Finish Carpentry)

A. Remove damaged or otherwise disfigured portions and replace with new prior to the Owner's acceptance.

B. Wash finished Work in strict accordance with product manufacturer's directions and ensure that washed surfaces do not differ from clean unwashed surfaces. Any difference will be considered unsatisfactory work.

3.4 FIELD QUALITY CONTROL

A. The Owner's Testing Agency shall:

1. Inspect erected timber framing as required to establish conformity of work with Drawings.

2. Inspect all bolted connections.

3. Inspect all timber connectors per CBC requirements.

4. Inspect roof diaphragm nailing for nail size, spacing and penetration at plywood panel edges, and special nailing at collector and drag members.

5. Inspect shear wall nailing for nail size, spacing and penetration at plywood panel edges, and nailing at holdown posts.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items, other than shop prefabricated casework.

B. Hardware and attachment accessories.

1.2 REFERENCES

A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E152 - Methods for Fire Tests of Door Assemblies.

C. AWPA - American Wood Preservers Association.

D. NFPA 80 - Fire Door and Windows.

E. UBC - Uniform Building Code.

F. UL - Underwriters' Laboratories, Inc.

G. WI - Woodwork Institute: Manual of Millwork.

1.3 QUALITY ASSURANCE

A. Manufacture millwork and finish carpentry items in accordance with quality standards of the Manual of Millwork of the Woodwork Institute.

B. Issue WI Certified Compliance Certificate to Architect prior to delivery of millwork and provide WI Certified Compliance Labels on all items of millwork.

C. All millwork and the installation of millwork shall be monitored for compliance under the scope of the WI Certified Compliance Program (CCP).

D. Provide WI Reinspection Service at the job site prior to installation. Provide to Architect a written report showing results of the reinspection.

E. Upon completion of the installation, provide a WI Certified Compliance Certificate.

1.4 REGULATORY REQUIREMENTS

A. Conform to UBC and UL requirements for fire ratings.

B. Conform to Flame Spread Classifications of Interior Millwork contained within the Appendix of the WI Manual of Millwork for flame spread ratings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, finishes, and accessories to a minimum scale of 1-1/2 inch to one foot. Provide WI Certified Compliance label on first page of each set.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products under provisions of Section 01 60 00.

B. Conform to Section 1 of Millwork Manual.

C. Store materials in ventilated, interior locations under constant minimum temperatures of 70 degrees F and maximum relative humidity of 50 to 55 percent.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Active member of the Woodwork Institute, licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this section (916) 372-9943.

B. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Materials specified under Millwork Manual Section Numbers refer to lumber grades in Millwork Manual as follows: Section 3, Lumber - Hardwood/Softwoods; Section 4, Plywood - Hardwood/Softwood; Section 6, Exterior Trim; Section 9, Interior Trim.

2.3 EXTERIOR TRIM

A. Fabricate in accordance with Section 6 of Millwork Manual (Match Existing):

Item	Species	Grade	Intended Finish
Exterior Wood Trim Fascias & Rakes	Redwood	Custom	Opaque
Exterior Board and batten siding	Redwood	Custom	Opaque

2.4 INTERIOR TRIM - PAINT GRADE

A. Finger jointed kiln-dried pine is acceptable for all areas except high moisture areas.

B. Trim profiles shall be mill standard shape numbers as indicated.

C. All paint-grade trim shall be pre-painted at mill.

2.5 INTERIOR TRIM - STAIN GRADE

A. Fabricate in accordance with Section 9 of Millwork Manual:

Item	Species	Grade	Intended Finish
Base, Casing & Trim	Red Oak	Custom	Transparent
Tackboard Frames, Chalk Rail & Frame (Not Used)	Red Oak	Custom	Transparent

2.6 MISCELLANEOUS INTERIOR MILLWORK

A. Fabricate in accordance with Section 9 of Millwork Manual:

Item	Species	Grade	Intended Finish
N/A	N/A	N/A	N/A

2.7 INTERIOR JAMBS - NON FIRE-RATED

A. Fabricate in accordance with Section 9 of Millwork Manual:

Item	Species	Grade	Intended Finish
Interior door & borrowed light frames stops and trim	Red Oak	Custom	Transparent

2.8 ADHESIVE

A. Adhesives: Type 1 adhesive recommended by WI to accommodate application in accordance with the Appendix to the Millwork Manual.

B. Formulation: Exterior type per AWPA C20, consisting of organic-resin solution, insoluble in water, thermally set in wood by kiln drying.

C. Wall Adhesive: Solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

2.9 WOOD TREATMENT PROCESS

A. Fire Retardant Type: Listed by Underwriters' Laboratories, Inc. (UL); capable of providing a maximum flame spread/smoke development rating of 20/25 in accordance with ASTM E84.

2.10 ACCESSORIES

A. Nails: Size and type to suit application, galvanized finish for interior use, stainless steel for exterior use.

B. Bolts, Nuts, Washers, Blind Fasteners, Lags, and Screws: Size and type to suit application; galvanized finish for interior use, stainless steel for exterior use.

C. Lumber for Shimming and Blocking: Softwood lumber of Douglas Fir species.

D. Primer: Alkyd primer sealer.

E. Wood Filler: Solvent base, tinted to match surface finish color.

2.11 FABRICATION

A. Fabricate work in accordance with WI Custom grade standards.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive work and field measurements are as instructed by the fabricator.

B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

C. Verify adequacy of backing and support framing.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials or that will be permanently concealed from view.

3.3 INSTALLATION

A. Install work in accordance with WI Manual of Millwork, Custom quality standard.

B. Install fire rated door frames in accordance with NFPA 80.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.5 PREPARATION FOR FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand Work smooth.

3.6 FINISHING

A. Site finish under provisions of Section 09 91 00.

3.7 PROTECTION

A. Protect finished installation under provisions of Section 01 60 00.

END OF SECTION

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SECTION 06 41 16
LAMINATE-CLAD WOOD CASEWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Special fabricated cabinet units.

B. Preparation for utilities.

C. Cabinet hardware.

D. Countertop

1.2 REFERENCES

A. WI - Woodwork Institute: Manual of Millwork.

B. NEMA LD3.1: High-Pressure Decorative Laminates.

1.3 QUALITY ASSURANCE

A. Manufacture casework items in accordance with quality standards of the Manual of Millwork of the Woodwork Institute.

B. Issue WI Certified Compliance Certificate to Architect prior to delivery of millwork and provide WI Certified Compliance Labels on all items of casework.

C. Provide WI Reinspection Service at the job site prior to installation. Provide to Architect a written report showing the results of the reinspection.

D. Upon completion of the installation, provide a WI Certified Compliance Certificate.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes. Provide WI Certified Compliance label on first page of each set.

C. Submit Samples of each color/pattern of plastic laminate cabinet facing.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Active member of the Woodwork Institute licensed by WI to provide WI Certified Compliance Certificates and Labels for the products and materials specified in this Section.

B. Substitutions: Under provisions of DIVISION 1.

2.2 CABINET DESIGN

A. Individual cabinets are indicated on the Drawings by the WI Design Numbering System, Section 15, Supplement No. 3.

B. A WI number followed by an "L" indicated on the Drawings requires that each door or pair of doors and drawers within that WI cabinet be individually lockable.

2.3 CASEWORK - LAMINATED PLASTIC COVERED

A. Fabricate in accordance with Section 15 of the Manual of Millwork:

1.	WI Grade:	Custom.
2.	Type:	Type I.
3.	Construction:	Style A-Frameless./ Flush Overlay w/ Let in hinges
4.	Joinery:	Doweled Joints.
5.	Cabinet Backs:	Dadoed (Detail 2C and 7C Millwork Manual).
6.	Cabinet Door Type:	Type A. Stile and rail (for glass).
7.	Shelves:	1-M-2 particle board, 1 inch thick, MOE of 950, capable of supporting 50 lb/sq ft load with deflection of L/144.
8.	Shelf Edge Bands	0.028 inch high pressure plastic laminate in color to match shelf. All 4 edges of adjustable shelves to receive banding.
9.	Door, Drawer, and Cabinet Drawer Box Edge Bands:	0.028 inch high pressure plastic laminate the same as exposed faces.
10.	Exposed Surfaces (Including Shelves and Interior of Open Front Cabinets):	0.028 inch high pressure plastic laminate, color and pattern as selected by Architect. A maximum of 5 colors and patterns to be selected by Architect from Nevamar's standard ARP textured, satin and woodgrain pattern finish.

11.	Semi-Exposed Surfaces (Behind Doors and Inside Drawers):	Low pressure decorative polyester or melamine laminate ALA-85.
12.	Exposed Laboratory Surfaces (Including Shelves and Interior of Open Front Cabinets):	Acid-resistant laminated plastic "Chemsurf" by WilsonArt, color as selected by Architect from standard patterns, satin finish.
13.	Security and Dust Panels:	Particleboard, 3/4 inch thick at all lockable drawers.
14.	Track for Sliding Glass Doors	Knape & Vogt No. 965.

2.4 GLAZING

A. Not included

2.5 HARDWARE

A. Finish: Polished chrome or stainless steel.

B. Shelf Standards: Knape and Vogt 255Z (bright zinc plated).

C. Shelf Supports: Knape and Vogt 256Z (bright zinc plated).

D. Shelf Fastener Supports: Knape and Vogt 243Z (bright zinc plated) 2 each shelf.

E. Drawer and Door Pulls: Epco MC-402-3.

F. Cabinet Locks: Corbin 0737/8, Olympus 500/600.

G. Drawer Slides: Accuride 3832A, 100 lbs. minimum.

H. Hinges: Rockford Process Control, No. 851, heavy duty wrap-around, tight pin butts of steel, 2-3/4 inch minimum width with companion magnetic door catch capable of a minimum 10 pound pull capacity. Stanley FW or SLCO equivalents are acceptable. Flush Overlay with hinges let into the door edge.

I. Magnetic Door Catch: Epco 591/592.

J. Sliding Door Track Assemblies: Grant 2023N sheaves and Grant 2011 track.

K. Grommets: Doug Mockett and Company, Inc. SG Series; plastic 3-1/2 inch diameter. Colors and locations as selected by Architect.

L. Hanger Rods: 1-1/16 inch diameter tubing, stainless steel.

M. Seismic Shelf Lip: 1/4 inch thick x 3 inch high acrylic plastic edging of color selected by Architect. Ease all edges of plastic.

N. Remainder of hardware required shall be as listed in Supplement No. 1 to Sections 14 and 15 of the Manual of Millwork.

2.6 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and sized to permit passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

B. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

C. In freestanding base casework with utilities, provide enclosed chase from penetration into casework (includes through floor penetrations) to termination at fixture. Utilities to be entirely concealed by chase. Provide plastic laminate clad face and edged banded removable access panels as necessary for full accessibility to utilities. Access panels to be located at unexposed portion of casework. Chase and access panels shall in no way reduce or infringe on ADA and Title 24 accessibility requirements.

D. Install plastic grommets in the field in plastic laminate casework and Owner-furnished furniture as directed by the Owner's Representative and/or Architect.

E. Install seismic shelf lips on all exposed edges of open laboratory shelving with flathead countersunk wood screws spaced 6 inches on center. Finish exposed screw heads to match color of shelf lip.

F. Install one adjustable shelf for each 12 inches of height for all wall mounted cabinets.

G. Provide stretcher at top face of all door and drawer fronts.

H. Fabricate base and full height cabinets 24 inches deep unless shown otherwise.

I. Fabricate wall mounted upper cabinets 12 inches deep unless shown otherwise.

J. Provide acid-resistant laminated plastic at all exposed surfaces (including shelves and interior of open front cabinets.)

2.7 LAMINATED PLASTIC COUNTERTOPS

A. Fabricate in accordance with Section 11 of the Manual of Millwork.

1.	WI Grade:	Premium.
2.	Core Thickness:	0.75 inch minimum.
3.	Laminate Thickness:	0.050 inch.
4.	Edge Covering:	No Drip
5.	Backsplash:	Coved.
6.	Top of Backsplash:	Waterfall with scribe
7.	Plastic Colors and Pattern:	To be selected by Architect from Nevamar's standard ARP, textured, satin and woodgrain pattern finishes

8. Core: marine grade plywood Pressure treat plywood with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry plywood to a maximum moisture content, of 15 percent.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Set and secure casework in place rigid, plumb, and level.

B. Install casework in accordance with Installation of Architectural Millwork, Section 26 of the Manual of Millwork.

3.3 ADJUSTING AND CLEANING

A. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.

B. Clean casework, shelves, hardware, fittings and fixtures.

3.4 SCHEDULE

A. All casework shall be plastic laminate covered unless specifically noted otherwise.

3.5 COUNTERTOP INSTALLATION

A. Install countertops in accordance with Installation of Architectural Millwork, Section 26 of the Manual of Millwork.

B. Make joints neatly, with uniform appearance.

C. Install Work plumb, level, true, and straight, with no distortions. Install with no variation in flushness of adjoining surfaces.

D Shim as required, using concealed shims.

E. 1Scribe and cut to fit adjoining Work.

F. Repair damaged and defective Work to eliminate visual and functional defects; where repair is not possible, replace Work.

G. Sealant: Install sealant as specified in Section 07 92 00, as required to close any small unavoidable gaps between counter and abutting surfaces.

END OF SECTION

SECTION 07 01 52

ROOFING REPAIR AND COATING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide all labor, equipment, and materials to maintain and protect the existing roof system.

1.2 RELATED SECTIONS

A. Section 07 60 00- Sheet Metal Flashing and Trim: Sheet metal flashing and trim.

1.3 SYSTEM DESCRIPTION

A. Roofing work including but not limited to:
   1. Flashing installation at new penetrations.
   2. Repair of damaged or deteriorated flashing.
   3. Install fill insulation where needed, two plies of base sheet and modified cap sheet per detail.
   4. All flashings to consist of one ply of base sheet set in mastic covered by an additional layer of modified bitumen membrane.
   5. Coat all new flashing and field of roof where indicated on ROOF PLAN.

1.4 PERFORMANCE REQUIREMENTS

A. Make roof weathertight and watertight. All drainage to flow off roof, do not permit standing water.

1.5 SUBMITTALS

A. See Section 01 33 00 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting conformance with specified requirements.

C. Manufacturer's Field Reports: Indicate deviations or deficiencies observed during site visits, record method of resolution.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
   1. Manufacturer will inspect completed work.

B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Foreman on job site during all phases of bituminous sheet roofing work and at any time roofing work is in progress, proper supervision of workmen shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.

C. Respond immediately to correction of roof leakage during construction. If the contractor does not respond within 24 hours, the Owner has the right to hire a qualified contractor and backcharge the original contractor.

1.7 PRE-INSTALLATION MEETING

A. Convene two weeks before starting work of this section. Meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in the around roofing that must precede or follow roofing work (including mechanical work if any), Architect/Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, test agencies, and governing authorities. Objectives to include:

B. Review preparation and installation procedures and coordinating and scheduling required with related work.
   1. Review methods and procedures related to roofing work.
   2. Review structural loading limitations of deck.
   3. Review roofing systems requirements (drawings, specifications, and other contract documents).
   4. Review required submittals, both completed and yet to be completed.
   5. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   6. Review required inspection, testing, certifying, and material usage accounting procedures.
   7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including provision of temporary roofing over occupied spaces.
   8. Record discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
   9. Review notification procedures for weather or non-working days.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing materials in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused rolled goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. Contractor shall secure all material and equipment on the job site. If material or equipment is stored on the roof, the contractor shall ensure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

1.9 PROJECT CONDITIONS

A. Coordinate roof repair installation with size, location and installation of roof mounted work.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Weather Condition Limitations: Do not apply materials during inclement weather or when a 40% chance of precipitation is expected.

B. Materials shall be stored at room temperature until immediately prior to application when the ambient temperature is 40°F or below. Discontinue the application if the material can not be stored at a temperature which permits even distribution during application.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 WARRANTY

A. Correct defective Work within two year period after Date of Substantial Completion.

B. Provide two year contractor warranty for roof repair.

C. Provide letter from manufacturer with original warranty number and approval of repair work.

PART 2 PRODUCTS

2.1 MATERIALS Basis of Design per The Garland Company, 800 762 8225 x 652.

A. Base Ply and Base Flashing Ply: Stressbase 80.

B. Field membrane at gravel roof: Stressply Plus, 105 mil SBS (Styrene-Butadiene-Styrene) smooth surfaced rubber modified roofing membrane reinforced with a dual fiberglass scrim and polyester mat, ASTM D-6162 Type III Grade G.

C. Modified Flashing Ply and field membrane on mineral surfaced roof: 135 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane reinforced with a dual fiberglass scrim and polyester mat, ASTM D-6162 Type III Grade G.

D. Asphalt Primer: V.O.C. compliant, ASTM D-41.

E. Flashing Bond Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, Type II.

F. Reinforcing Fabric: Fiberglass Mesh

G. Flood coat adhesive: Weatherscreen.

H. Gravel: Clean river rock.

I. Aluminized mastic: Silverflash.

J. Insulation: ½" coated wood fiber.

K. Insulation fasteners: as approved by Garland.

L. Roof coating: Pyramic Plus.

2.2 Substitutions as allowed per Division 1 General Requirements

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Roof System Manufacturer and Installer.

3.2 INSTALLATION

A. Spud gravel back from edge of cut in existing roof a minimum of 18”.

B. Prepare all penetrations to be flashed and where shown on the drawings, with asphalt primer at the rate of one hundred (100) square feet per gallon. Allow primer to dry tack free.

C. All plies will be adhered with the following:
   1. With mastic. The base flashing and the modified membrane will be used as the flashing and nailed off 8" O.C. at all vertical surfaces.

D. The entire sheet of the base flashing and the flashing membrane must be solidly adhered to the substrate.

E. Seal all vertical laps of flashing membrane with a three-course application of Silverflash and fiberglass mesh.

F. Seal junction of flashing membrane and roof with a three-course application of Silverflash and mesh.

G. Install all work in accordance with manufacturer's instructions.

H. Flood and gravel up to the base of the cant where gravel is existing.

I. Coat all flashing with a applications of Pyramical Plus at 1 gal per sq. coat. Apply 2 coats.

J. Roof coating: coat roof with 2 applications of Pyramic plus at 1.5 gal per sq. per coat. Apply 2 coats.

3.3 INTERFACE WITH OTHER WORK

A. Coordinate with roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with the roofing work as specified in other sections to avoid conflict or omission in waterproofing systems and to provide watertight installation.

3.4 FIELD QUALITY CONTROL

A. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each parting attending.

C. The Roofing System Manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor at a negotiated price.

D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace (as required) deteriorated or defective work found at time above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. The Contractor is to notify the Owner upon completion of corrections.

G. Following the final inspection, acceptance will be made in writing by the material manufacturer.

3.5 CLEANING and PROTECTION

A. Clean roof and surrounding surfaces.

B. Protect installed work from subsequent construction operations.

C. Do not permit traffic over unprotected roof surface.

END OF SECTION

SECTION 07 13 00
WEATHER-RESISTIVE BARRIER AND FLASHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Weather-resistive barriers, self-adhered flashing and other associated accessories for exterior finish systems.

1.2 RELATED SECTIONS

A. Section 01 73 29: Cutting and Patching.

B. Section 007 92 00: Joint Sealers.

C. Section 09 29 00: Gypsum Sheathing

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's literature describing each weather barrier and flashing.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. American Society for Testing Materials (ASTM).

2. California Building Code, 2016 Edition, with all applicable amendments.

3. Per Specification 01 41 00

B. Performance Characteristics:

1. Membrane system shall provide a watertight barrier to prevent passage of water into the building.

2. Membrane shall seal around penetrating fasteners and meet the strictest requirements of ASTM D1970.

C. Single Source Responsibility for Products: Obtain each type of building weather-resistive barrier and flashing from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

D. Submit example of wall waterproofing manufacturer’s warranty, as specified herein, prior to

beginning Work. Provide executed warranty upon Project closeout.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01 60 00.

B. Deliver and store packaged materials in original containers bearing identification of manufacturer's name, components materials, application details, recommendations for application and use, and test data substantiating that products comply with Contract requirements. Maintain seals unbroken and labels intact until time of use.

C. Keep materials dry by storing off ground under watertight covers.

E. MSDS sheets for all materials, cleaners, and solvents used.

1.6 PROJECT CONDITIONS

A. Comply with requirements of Section 01 45 00.

B. Do not install products until construction has progressed to a point that inclement weather will not damage existing or repaired conditions.

1.7 QUALITY REQUIREMENTS

A. Engage experienced personnel to perform Work of this Section. The Contractor shall have completed installations similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance, for a period of at least five years.

B. Obtain each type of material comprising the wall waterproofing system, from a single manufacturer for the duration of the Project.

C. Provide effective, full-time quality control over all fabrication and installation activities. Full responsibility for quality control shall remain with the Contractor.

D. Perform inspections to ensure strict conformance to the Contract at all phases of construction. Inspect components for proper alignment and placement, attachment, workmanship, and damage. Inspect the Work prior to covering any part of the Work of this Section, or releasing for subsequent Work by other trades.

1.8 WARRANTY

A. Warranty all Work under this Section in a document stating that:

1. If, within two years after the date of Substantial Completion of this Work, any of the Work of this Section is found to be defective or not in accordance with the Contract Documents, the Contractor shall, at its sole cost and expense, correct it promptly after receipt of a written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition.

2. The Contractor shall bear all costs incurred by the Owner, including reasonable attorney’s

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fees, court costs, and expert witness and consultant fees, to enforce Contractor's compliance with the obligations of this warranty.

3. The obligations of this warranty shall run directly to the Owner and its successors and assigns and may be enforced by the Owner and its successors and assigns against the Contractor, shall survive the termination of the Contract, and shall not be limited by the conditions other than this Contract.

B. Provide five-year manufacturers' material warranties for the self-adhered membrane liquid membrane for the building underlayment.

1.9 PRECONSTRUCTION CONFERENCE

A. Attend a preconstruction conference to be held with the Owner, Architect, and all other involved trades to discuss and coordinate the Work specified in this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Flashing: "Vycor V40" manufactured by Grace Construction Products; 0.040 inch thick, self-adhering rubberized-asphalt membrane with integrally bonded polyethylene laminate, minimum 6 inches in width.

B. Flexible Flashing: Grace Construction Products, Self-Adhesive Bituthene 5000.

C. Primer for Wood, Gypsum and Other Surfaces: "Perm-A-Barrier WB" Primer.

D. Underlayment: Asphalt-saturated, Kraft, Grade D, 60-minute building paper, "Super Jumbo Tex" manufactured by Fortifiber Corporation.

E. Weather-Resistive Barrier: "Tyvek StuccoWrap" manufactured by DuPont Building Innovations.

F. Accessories: Seam Tape, fasteners, sealants, primers and adnesives as recommended by weather barrier and/or flashing manufacturer.

G. Substitutions: Under provisions of Section 01 62 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify all site conditions and dimensions by field measurement in consideration of the special conditions associated with repairs to existing construction prior to development of submittals and to material fabrication, purchase or delivery. Notify the Architect immediately of any inconsistency between the conditions found and those shown in the Drawings.

B. Before starting Work in a given area, examine all surfaces to receive waterproofing membrane

for roughness, ridges, contaminants, unsound substrates or other conditions that may impair the installation. Promptly report any such conditions to the Architect. Correct all defective conditions before commencing Work.

3.2 FLASHING INSTALLATION

A. Follow all manufacturers' recommendations, except as modified herein. Ensure that surfaces to receive primer and membrane are clean and dry.

B. Fully and completely adhere membrane to the primed substrate using a neoprene roller. Wrinkles, open laps, blisters, perforations or "fish mouths" in the membrane are not acceptable. Promptly repair defects in the membrane. Do not allow membrane installation defects to be concealed by Work of other Sections.

C. Ensure all membrane material is continuously supported.

D. Provide continuous membrane flashing at all openings. Flash rough openings, penetrations, and other appurtenances whether shown or not on the Drawings and to provide airtight and watertight assembly.

E. Provide minimum lap onto existing weather resistive barrier of 6 inches. Ensure existing material is clean and sound, as required by manufacturer.

F. Configure membrane flashings to maintain laps to shed water; shingle flashings over onto metal flashings. Provide a minimum 6 inches lap onto face of adjacent sheathing or waterproofing unless detailed otherwise.

3.3 UNDERLAYMENT INSTALLATION

A. Begin application of first layer of building underlayment at bottom of wall and proceed up the surface. Precut into 8 feet maximum lengths and apply sheets horizontally in a shingled manner, providing 6 inches side laps and 6 inches end laps. Stagger end laps 24 inches minimum. Roll out sheets onto wall and align. Secure to building sheathing using staples. Use only as many staples as necessary to prevent sagging. Favor stapling through laps over stapling through the field of the sheet.

B. Ensure that the building underlayment is continuous around all building corners and transitions. Wrap from one side of the wall around the corner, then wrap from the other side over the corner to lap over the first sheet. Do not cut short at corners and transitions.

C. Promptly repair all rips or tears. To repair damaged areas, use a piece of building underlayment that extends 12 inches beyond the tear. Tuck the top edge of this piece underneath the sheet above the tear to create a lap that will shed water.

D. Tie building underlayment into all openings, penetrations, and flashings whether shown on the Drawings or not.

E. Minimize exposure of the building underlayment to rain. Promptly install rainscreen and/or siding upon completion of the building underlayment installation.

3.4 GENERAL

A. Install materials in accordance with the manufacturers' recommendations, using fasteners, seam tape, and other accessories intended for the purpose.

B. Lap joints to direct water to the exterior.

C. Provide complete coverage to produce a continuous weathertight barrier.

3.5 PATCHING

A. Promptly repair all rips, tears, or holes in the membrane, using precut sheets of membrane that extend 6 inches beyond the damaged area in all directions.

B. Extend patch sheets vertically and fit snugly against the lower edge of the membrane above to avoid creating backwater laps in the membrane.

END OF SECTION

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Bid Set - Not For Construction 3/11/2019

SECTION 07 13 50
SHEET MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.2 SUMMARY

A. The work of this section includes, but is not limited to, the following:

1. Below grade waterproofing membrane system.
2. Pre-applied sheet waterproof membrane (for vertical applications).
3. Prefabricated drainage panel.

B. Related Sections: Other specification sections which directly relate to the work of this section include, but are not limited to, the following:

1. Section 31 30 00 - Earthwork
2. Section 03 30 00 - Cast-In-Place Concrete
3. Section 07 26 50 - Vapor Barriers
4. Section 07 62 00 - Flashing and Sheet Metal
5. Section 07 90 00 - Joint Sealers
6. Section 22 40 00 - Plumbing

1.3 REFERENCE STANDARDS

A. The following standards and publications are applicable to the extent referenced in the text.

B. American Society for Testing and Materials (ASTM)

C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course

D 412 Standard Test Methods for Rubber Properties in Tension

D 570 Standard Test Method for Water Absorption of Plastics

D 882 Standard Test Methods for Tensile Properties of Thin Plastic Sheeting

D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds

D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)

D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

D 3767 Standard Practice for Rubber - Measurements of Dimensions

D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes

E 96 Standard Test Methods for Water Vapor Transmission of Materials

E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations. Include certification of data indicating VOC (Volatile Organic Compound) content of all components of waterproofing system.

B. Samples: Submit representative samples of the following for approval:

1. Below grade waterproofing sheet membrane.

2. Pre-applied sheet waterproof membrane.

3. Prefabricated drainage panel.

4. Waterstop

1.5 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

B. Installer: A firm which has at least 3 years experience in work of the type required by this section.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

E. Schedule Coordination: Schedule work such that membranes will not be left exposed to weather for longer than that recommended by the manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety

data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
2. Protect mastic and adhesive from moisture and potential sources of ignition.
3. Store drainage composite or protection board flat and off the ground. Provide cover on top and all sides.
4. Protect surface conditioner from freezing.

B. Sequence deliveries to avoid delays, but minimize on-site storage.

1.7 PROJECT CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.8 WARRANTY

A. Sheet Membrane Waterproofing: Provide written 5 year material warranty issued by the membrane manufacturer upon completion of the work.

PART 2 - PRODUCTS

2.1 MATERIALS : Grace or approved equal.

A. Below Grade Waterproofing Membrane System: Bituthene System 4000 Membrane by Grace Construction Products or approved equal; a self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm (0.056 in.) of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.

PHYSICAL PROPERTIES FOR BITUTHENE SYSTEM 4000 MEMBRANE:

Property	Test Method	Typical Value
Color		Dark gray-black
Thickness	ASTM D 3767 Method A	1.5 mm (0.060 in.) nominal
Flexibility, 180° bend over 25 mm (1 in.) mandrel at -43°C (-45°F)	ASTM D 1970	Unaffected
Tensile Strength, Membrane	ASTM D 412 Modified[1]	2240 kPa (325 lbs/in.^{2})

Die C		minimum
Tensile Strength, Film	ASTM D 882 Modified[1]	34.5 MPa (5,000 lbs/in.^{2}) minimum
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 Modified[1]	300% minimum
Crack Cycling at -32°C (-25°F), 100 Cycles	ASTM C 836	Unaffected
Lap Adhesion at Minimum Application Temperature	ASTM D 1876 Modified[2]	880 N/m (5 lbs/in.)
Peel Strength	ASTM D 903 Modified[3]	1576 N/m (9 lbs/in.)
Puncture Resistance, Membrane	ASTM E 154	222 N (50 lbs) minimum
Resistance to Hydrostatic Head	ASTM D 5385	70 m (231 ft) of water
Permeance	ASTM E 96, Section 12 – Water Method	2.9 ng/m^{2}sPa (0.05 perms) maximum
Water Absorption	ASTM D 570	0.1% maximum

Footnotes:

1. *The test is run at a rate of 50 mm (2 in.) per minute.*
2. *The test is conducted 15 minutes after the lap is formed and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).*
3. *The 180° peel strength is run at a rate of 300 mm (12 in.) per minute.*

B. Pre-applied Sheet Waterproofing Membrane: Preprufe 300R by Grace Construction Products or approved equal; a 1.2mm (0.046 in.) nominal thickness composite sheet membrane comprising 0.8 mm (0.030 in.) of high density polyethylene film, and layers of synthetic adhesive. The membrane shall form an integral and permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete. Provide membrane with the following physical properties:

PHYSICAL PROPERTIES FOR PREFRUFE 300R MEMBRANE

Property	Test Method	Typical Value
Color		White
Thickness	ASTM D 3767 Method A	1.2 mm (0.046 in.) nominal
Low Temperature Flexibility	ASTM D 1970	Unaffected at -23°C (-10°F)
Elongation	ASTM D 412 Modified[1]	>300%

Crack Cycling at -23°C (-10°F), 100 Cycles	ASTM C 836	Unaffected
Tensile Strength, Film	ASTM D 412	27.6 MPa (4,000 lbs/in.^{2}) minimum
Peel Adhesion to Concrete	ASTM D 903 Modified[2]	880 N/m (5.0 lbs/in.)
Lap Adhesion	ASTM D 1876 Modified[3]	440 N/m (2.5 lbs/in.)
Resistance to Hydrostatic Head	ASTM D 5385 Modified[4]	>70 m (231 ft)
Puncture Resistance	ASTM E 154	990 N (180 lbs) minimum
Permeance	ASTM E 96 Method B	<0.6 ng/m^{2}sPa (0.01 perms)
Water Absorption	ASTM D 570	<0.5%

Footnotes:

1. *Elongation of membrane is run at a rate of 50 mm (2 in.) per minute. Concrete is cast against the protective coating surface of the membrane and allowed to cure (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.*
2. *The test is conducted 15 minutes after the lap is formed as per manufacturer's instructions and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).*
3. *Hydrostatic head tests are performed by casting concrete against the membrane with a lap. Before the concrete sets a 3 mm (0.125 in.) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to a head of 70 m (231 ft) of water which is the limit of the apparatus.*

C. Prefabricated Drainage Panel: Hydroduct 220 Drainage Composite by Grace Construction Products or approved equal. Drainage Composite shall be designed to promote positive drainage while serving as a protection course.

D. Preprufe 160R: Water proofing membrane, edges taped with Preprufe Tape Lt, penetrations sealed with Bituthene Liquid Membrane.

E. Miscellaneous Materials:

1. Primer: Bituthene Primer B2

2. Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing systems.

3. Insulation Board: 2-inch XPS Insulation Board

PART 3 - EXECUTION

3.1 EXAMINATION

A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION OF SUBSTRATES

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing. Do not proceed with work until unsatisfactory conditions are corrected and are acceptable for compliance with manufacturers' warranty requirements.

B. Cast-In-Place Concrete Substrates:

1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).

2. Fill form tie rod holes with concrete and finish flush with surrounding surface.

3. Repair bugholes over 13 mm (0.5 in.) in length and 6 mm (0.25 in.) deep and finish flush with surrounding surface.

4. Remove scaling to sound, unaffected concrete and repair exposed area.

5. Grind irregular construction joints to suitable flush surface.

C. Wood Substrates: Apply waterproofing membrane over securely fastened sound surface. All joints and fasteners shall be flush to create a smooth surface.

D. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.3 INSTALLATION - BELOW GRADE WATERPROOFING MEMBRANE SYSTEM

A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:

1. Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.

2. Delay application of membrane until surface conditioner is completely dry. Dry time will vary with weather conditions.

3. Seal daily terminations with troweled bead of mastic.

4. Apply prefabricated drainage panel, waterstop and related materials in accordance with manufacturer's recommendations.

3.4 INSTALLATION - PRE-APPLIED SHEET WATERPROOFING MEMBRANE

A. Substrates shall be smooth and sound.

B. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:

1. Apply membrane with the HDPE film facing the prepared soil retention system (wood lagging, sheet piling, gunite, shotcrete, etc.). Remove the release liner and fasten membrane along uncoated edge to Hydroduct drainage composite with large head nails or to plywood with large head nails or staples.

2. Apply succeeding sheets by overlapping the previous sheet 75 mm (3 in.) along the uncoated edge of the membrane. Side laps must be firmly rolled to ensure a tight seal.

3. Overlap the ends of the membrane 75 mm (3 in.). Apply Preprufe Tape centered over the end lap and roll firmly to ensure a tight seal. Remove release liner.

3.6 CLEANING AND PROTECTION

A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION

SECTION 07 21 30
BUILDING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Batt insulation and vapor barrier in exterior wall and roof construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

C. Batt sound insulation in interior walls and partitions and above ceiling.

D. Rigid insulation – to be placed on roof areas.

1.2 REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

B. ASTM C1320 - Installation of Mineral Fiber Batt and Thermal Insulation for Light Frame Construction.

C. CCR - California Code of Regulations.

D. CBC - Uniform Building Code.

E. Business and Professions Code.

1.3 PERFORMANCE REQUIREMENTS

A. Materials of this Section shall provide continuity of thermal and moisture barrier at building enclosure elements.

B. Materials of this Section shall provide continuity of sound control where indicated or scheduled.

1.4 REGULATORY REQUIREMENTS

A. Installation of insulation may only commence if insulation meets mandatory manufacturer certification to the California Energy Commission required by Title 24, Part 6, Section 118 of the California Code of Regulations (CCR) that insulation complies with Title 20, Chapter 4, Article 3 of the California Quality Standards for Insulating Materials.

B. Insulation materials shall be certified in compliance with Business and Professions Code Section 19165.

C. Insulation manufacturer shall be licensed by the California Department of Consumer Affairs, Bureau of Home Furnishing and Thermal Insulation according to Business and Professions Code, Section 19059.7.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Product Data for each type of insulation specified.

C. Submit manufacturer's certification that materials meet or exceed specified regulatory requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - INSULATION MATERIALS

A. Certain Teed Corp.

B. Manville Corp.

C. Owens-Corning Fiberglass Corporation.

D. Substitutions: Under provisions of Section 01 62 00

2.2 MATERIALS

A. Batt Insulation: ASTM C665 preformed glass fiber batt, Type III, Class A, with reflective membrane faced surface with a flame spread of 25 or less, and a smoke density of less than 50 when tested in accordance with CBC Standard No. 8-1.Category 1 with stapling flanges for attachment of blanket to applicable construction. Equivalent continuous roll membrane facing may be utilized in lieu of individual faced glass fiber batts. Provide R19 at walls.

B. Batt Sound Insulation: ASTM C665 preformed glass fiber batt, Type I unfaced, with flame spread of 25 or less, and a smoke density of less than 450 when tested in accordance with CBC Standard No. 8-1. Provide R-11, 3-1/2 inch minimum thickness.

C. Rigid insulation: ASTM e136, ASTM C653 and C518 Insulation. Provide R30 at roofs.

D. Nails or Staples: Steel wire; electroplated; type and size to suit application.

E. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inches wide.

F. Support Wire: 16 gauge steel wire.

G. Support Rods: 13 gauge, pointed spring steel length as required for stud spacing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

B. Do not install until building is fully enclosed to weather.

3.2 INSTALLATION

A. Install insulation in accordance with insulation manufacturer's instructions and ASTM C739, C1149 and C1320.

B. Install batt insulation in exterior walls, ceiling furring, and roof spaces without gaps or voids. Where wood framed furred ceiling occur, install insulation over the furring strips rather than between the rafters.

C. Install batt sound insulation in interior walls and where indicated or scheduled.

D. Trim insulation neatly to fit spaces.

E. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.

F. Install with factory-applied membrane facing on warm side of building spaces.

G. Lap ends and side flanges of vapor barrier membrane over face of framing members.

H. Extend vapor barrier on to any adjacent construction and tape seal edge of vapor barrier.

I. Seal butt ends, lapped flanges, and tears or cuts in membrane with tape or another layer of membrane.

J. Seal joints in vapor barrier caused by pipes, conduits, electrical boxes, and similar items penetrating vapor barrier.

K. Face staple flange over flange of adjacent blanket to wood studs at maximum 6 inches on center.

L. Tape stapling flange over flange of adjacent blanket to flange of metal stud.

M. Friction fit sound insulation between studs as required to completely fill space between the wall finishes.

N. Where wall finish does not occur use 16 gauge support wire through studs at not more than 16 inches on center vertically at metal studs.

O. Remove all unused insulation and related products and dispose of correctly.

END OF SECTION

SECTION 07 26 13
VAPOR RETARDER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vapor retarder under concrete slab-on-grade.

B. Crush and fine protection course or pouring concrete on vapor barrier.

1.2 RELATED SECTION includes but is not limited to

A. Section 03 30 00: Cast-in-Place Concrete.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Product Data, including product description and performance.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor Retarder: High tensile strength, high puncture resistance, ultralow moisture vapor permeability
"VaporBlock" 10 by Raven Industries,
"Moistop Plus" by Fortifiber Corp., JumboTex permeable weather-resistive barrier
"Perminator10" by WR Meadows,
"Stego Wrap Vapor Barrier" (15 mil) by Stego Industries LLC

1. ASTM E154 Section 13 after conditioning–ASTM E96: <0.099 perms.

2. ASTM D1709 Method B Puncture Resistance: > 2,600grams.

3. ASTM E154 - Section 9 Tensile Strength after conditioning exposure: >93 N/cm (53 lbs/in).

B. Sand: ASTM C33, uniformly graded, clean sand, free from excessive fines, organic materials, and other deleterious substances.

C. Vapor-Retarder Tape: Minimum 4-inch-wide self-adhering type designed to maintain vapor retarder integrity.

B. Pipe Boots: Pre-fabricated penetration kit for securing around pipes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Check that areas to receive vapor barrier are clean and dry.

B. Check that pipes, vents, drains, and other penetrations of the membrane are completed including but not limited to secured with pipe boots, lapped and tapped.

C. Where nails, screws, or other penetrations exist, apply heavy beads of calking compound or manufacturer's pressure-sensitive tape.

D. Do not commence installation of vapor retarder until conditions are satisfactory.

3.2 INSTALLATION UNDER SLAB-ON-GRADE

A. Install vapor retarder over rock base course.

1. Lap 6 inches, and tape edges.

2. Turn up membrane at edges, and secure to foundations or footings with tape, concrete nails ever 6 feet or mastic.

B. Seal all penetrations of vapor retarder with tape to create air-tight seal between penetrating objects and vapor retarder.

C. Repair tears and punctures in vapor retarder immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

D. Provide nominal 2-inch-thick protection cover of crush and fine rock and sand over vapor retarder.

1. Screed and level before reinforcing or concrete is placed.

2. Moisten sand prior to placing concrete.

END OF SECTION

SECTION 07 26 40
MOISTURE VAPOR EMISSION CONTROL

PART 1 GENERAL

1.2 DESCRIPTION

A. Work under this Section includes, but is not necessarily limited to vapor control barrier.

B. Related Sections include the following:

1. Section 03 54 16 Cast Underlayment

2. Section 09 68 00 Carpet

3. Section 09 65 00 Resilient Flooring

1.3 SYSTEM DESCRIPTION

A. This Section includes, fast curing, epoxy moisture management system formulated to suppress excessive moisture vapor emissions in new or existing concrete prior to instillation of cast underlayment with topping and resilient flooring and/or carpet flooring system.

1.4 REFERENCES

A. ASTM F2170 – Relative Humidity in Concrete Floor Slabs Using in situ Probes.

B. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

C. ASTM C1583 - Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension.

D. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials

E. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes

F. ASTM D2369 – Standard Test Method for Volatile Content of Coatings

G. ASTM F3010 - Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.

1.5 SUBMITTALS

A. GENERAL: Refer to Section 01 33 00

B. PRODUCT DATA: Manufacturer's specification, data, and installation instructions.

C. Submit installer 'certificate'.

D. Warranty certificate as specified.

1.6 QUALITY ASSURANCE

A. Applicator: Must be "Certified" with the product manufacturer as being trained and qualified to apply the specified product.

1.7 PRODUCT HANDLING

A. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for not less than 5 years. Contact Manufacturer Representative prior to installation.

1.8 JOB CONDITIONS

A. Concrete surface temperature shall be 50 to 90°F. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section.

1.9 WARRANTY

A. 15 year warranty if product is applied by a trained and manufacturer approved installer.

1. Warranty; Beginning on the date the project was finished the specified product manufacturer will warrant the system against material defects and the vapor transmission reduction as shown in the manufacturer printed literature is subject to the condition and restrictions set forth in the warranty.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. ARDEX Americas (888) 512-7339

B. AQUAFIN, Inc. (866) –AQUAFIN

C. Approved Equal.

2.2 PRODUCTS

A. Basis of Design: Ardex MC RAPID

2.2 PHYSICAL PROPERTIES

B. 1. Performance and Physical Properties: Meet or exceed the following values for material cured at 70° F+/-3°F (21° C+/-2°C) and 50% +/-5% relative humidity:

1. Application: Manual

2. Material Requirements on CSP 3 Prepared Concrete: Approx. 250 - 270 sq. ft. (25 m2) per mixed unit for 10 mils, and approx. 170 – 109 sq. ft. (16-18 m2) per mixed unit for 14 mils

3. Permeability (ASTM E96): 0.06 perms

4. 14 pH solution (ASTM D1308): No effect

5. Working Time: 20 minutes

6. Pot Life: 20 minutes

7. VOC: 19.9 g/L, A+B, ASTM D2369

8. Walkable: Minimum of 4 hours

9. Install underlayment or topping: Minimum 4 hours,

EXECUTION

3.1 INSTALLATION

A. Concrete Subfloors: Prepare substrate in accordance with manufacturer's instructions.

1. Prior to proceeding please refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before application.

2. Mechanical preparation of the surface is required to obtain a minimum ICRI concrete surface profile of 3 (CSP 3). This substrate preparation must be by mechanical means, such as shot blasting.

B. The concrete must have a minimum tensile strength of at 150 psi (10.5 kg/cm 2) for area sto receive normal foot traffic and 200 psi (14 kg/cm2) for areas of heavy commercial traffic when tested in accordance with ASTM C1583.

C. Prior to beginning the installation, the relative humidity within the concrete can be measured (ASTM 2170). No standing water shall be present.

D. If the concrete substrate is too uneven for uniform installation of the vapor control, pre smooth the

substrate with a manufacturer approved moisture resistant path self leveling prior to installation.

E. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

3.2 FIELD QUALITY CONTROL

A. Floor Covering Applications

1. Post installation moisture test not required after the installation or product.

2. Disposal of product should be done in accordance with current local, state and federal regulations.

END OF SECTION 07 26 40

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SECTION 07 27 20
FLUID-APPLIED AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Materials and installation methods for fluid applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.

2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

B. Related Sections include the following:

1. Section 03 30 00 - Cast-In-Place Concrete

4. Section 07 13 50 - Sheet Membrane Waterproofing

6. Section 07 26 50 - Vapor Barriers

7. Section 07 62 00 - Flashing and Sheet Metal

8. Section 07 90 00 - Joint Sealers

1.3 DEFINITIONS

A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Commonwealth of Massachusetts Building Code Requirements: The intent of this specification is to require compliance with 780 CMR 13, Section 1304.3 Air Leakage, 1304.3.1 Air Barriers:

The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:

1. It must be continuous, with all joints made airtight.

2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/sq. m @ 75 Pa.).

3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.

4. It shall be durable or maintainable.

5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:

    a. Foundation and walls.

    b. Walls and windows or doors.

    c. Different wall systems.

    d. Wall and roof.

    e. Wall and roof over unconditioned space.

    f. Walls, floor and roof across construction, control and expansion joints.

    g. Walls, floors and roof to utility, pipe and duct penetrations.

6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.5 REFERENCES

A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

B. American Society for Testing and Materials (ASTM)

1. C920 Specifications for Elastomeric Joint Sealants
2. C1193 Guide for Use of Joint Sealants
3. D412 Standard Test Methods for Rubber Properties in Tension
4. D570 Test Method for Water Absorption of Plastics
5. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
6. D1876 Test Method for Peel Resistance of Adhesives
7. D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
8. D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
9. D4258 Practice for Surface Cleaning Concrete for Coating
10. D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
11. E96 Test Methods for Water Vapor Transmission of Materials
12. E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
13. E162 Test Method for Surface Flammability of Materials Using a Radiant Heat Source
14. E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
15. E2178-01 Standard Test Method for Air Permeance of Building Materials
16. E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.6 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.

2. Include details of mockups.

C. Samples: Submit representative samples of the following for approval:

1. Fluid applied membrane

2. Transition Membrane

3. Through Wall Flashing

D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

E. Qualification Data: For Applicator.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.10.

1.7 QUALITY ASSURANCE

A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

B. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer. Should project require a vapor permeable and a vapor impermeable air barrier on same project, obtain vapor-permeable and vapor impermeable air barrier and through wall flashing from one source from a single manufacturer. See specification Section 07 27 00 for fully-adhered vapor impermeable air barrier.

C. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

D. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate sur-

face preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed.

2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Pre-installation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:

1. Review of submittals.

2. Review of surface preparation, minimum curing period and installation procedures.

3. Review of special details and flashings.

4. Sequence of construction, responsibilities and schedule for subsequent operations.

5. Review of mock-up requirements.

6. Review of inspection, testing, protection and repair procedures.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer’s instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.

C. Protect fluid-applied membrane components from freezing and extreme heat.

D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTY

A. Material Warranty: Manufacturer's standard form in which manufacturer agrees to replace fluid-applied air barrier membrane materials that fail within specified warranty period when installed and used in strict conformance with written manufacturer's instructions.

1. Failures include, but are not limited to, the following:

a. Failure to maintain air permeance rating not to exceed .004 cfm/sq. ft (0.02 L/s/sq. m.) when tested per ASTM E2178, within specified warranty period.

b. Failure to maintain a vapor permeance rating greater than 10 perms when tested in accordance with ATM E96, Method B.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER

A. Fluid-Applied, Fully-Adhered, Vapor-Permeable Membrane Air Barrier, Basis of Design: Subject to compliance with requirements, provide the following:

1. Single Component Acrylic Membrane: Perm-A-Barrier VP, as manufactured by Grace Construction Products, or approved equal.

B. Physical and Performance Properties: Provide products with the following minimum properties:

1. Membrane Air Permeance: Not to exceed 0.0004 cfm/sq. ft. of surface area (at specified thickness) at 1.57-lbf/sq. ft. pressure difference (0.002 L/s x sq. m of surface area at 75-Pa) when applied to CMU wall; when tested per ASTM E2178.

2. Membrane Vapor Permeance: Not less than 11.2 perms (649.6 ng/Pa x s x sq. m); when tested per ASTM E96.

3. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 pounds per square foot) (0.004 L/s x sq. m of surface area at 75-Pa) when tested in accordance with ASTM E 2357.

4. UV Exposure Limit: Not more than 180 calendar days; per ASTM D412 and ASTM E96-Method B.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Liquid Membrane for Details and Terminations: Provide Bituthene Liquid Membrane as manufactured by Grace Construction Products, or approved equal.

C. Wall Primer (for Use with Throughwall Flashing and Tapes Applied to Substrate): Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

1. Flash Point: No flash to boiling point

2. Solvent Type: Water

3. VOC Content: Not to exceed 10 g/l

4. Application Temperature: -4°C (25°F) and above

5. Freezing point (as packaged): -7°C (21°F)

6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products.

D. Flexible Membrane Wall Flashing: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.

2. Water Absorption: ASTM D570: max. 0.1% by weight

3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.

4. Tear Resistance

a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.

b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.

5. Lap Adhesion at -4ºC (25ºF): ASTM D1876: 880 N/m (5.0 lbs./in.) of width

6. Low Temperature Flexibility ASTM D1970: Unaffected to -43ºC (-45ºF)

7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)

8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

9. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

E. Joint Reinforcing Strip: Air barrier manufacturer's approved tape.

F. Transition Membrane: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.

2. Water Absorption: ASTM D570: max. 0.1% by weight

3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.

4. Tear Resistance

   a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.

   b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.

5. Lap Adhesion at -4ºC (25ºF): ASTM D1876: 880 N/m (5.0 lbs./in.) of width

6. Low Temperature Flexibility ASTM D1970: Unaffected to -43ºC (-45ºF)

7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)

8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

9. Product: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

1. Product: Bituthene Liquid Membrane, manufactured by Grace Construction Products.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.

3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier system.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 - 75mm (2-3 in.) wide, manufacturer's recommended self-adhesive tape. Gaps greater than 6mm (1/4 in.) shall be filled with mastic or caulk, allowing sufficient time to fully cure before application of the tape and fluid applied air barrier system.

C. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

D. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

E. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

F. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

G. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

H. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

J. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.

1. Prime substrate as required.

B. Plywood Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply tape to joint prior to installing fluid air barrier membrane.

3.4 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 45-mil (1.2-mm) dry film thickness.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.5 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

3. Install all flashings only after application of air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.

2. Continuous structural support of air barrier system has been provided.

3. Concrete surfaces are smooth, clean and free of cavities, and protrusions.

4. Site conditions for application temperature and dryness of substrates have been maintained.

5. Maximum exposure time of materials to UV deterioration has not been exceeded.

6. Surfaces have been primed, if applicable.

7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.

8. Termination mastic has been applied on cut edges.

9. Strips and transition strips have been firmly adhered to substrate.

10. Compatible materials have been used.

11. Transitions at changes in direction and structural support at gaps have been provided.

12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.

13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:

1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, smoke pencil with pressurization or depressurization.

D. Remove and replace deficient air barrier components and retest as specified above.

3.7 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 150 days.

C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Remove masking materials after installation.

END OF SECTION

SECTION 07 55 00
MODIFIED BITUMEN ROOFING

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. The work under this contract shall include all, labor, materials, tools, transportation, equipment, services, and facilities necessary for, and reasonably incidental to, the completion of the work as shown on the drawings and/or described in the specifications, for the following scope of work:

1. Roof installation scope of work:.
   a. Mechanically attach insulation to the structural deck.
   b. Apply primer for self adhesive sheets.
   c. Install base ply.
   d. Install a modified bitumen cap sheet.
   e. Fabricate and install all new sheet metal.
   f. Install a base ply and a mineral surfaced modified membrane at all perimeter and projection baseflashings.
   g. Install surfacing as indicated on roof plans.

1.2 RELATED SECTIONS

A. Section 07 60 00 – Sheet Metal Flashing and Trim

1.3 REFERENCES

ASTM D - 41 Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing
ASTM D - 312 Specification for Asphalt Used in Roofing
ASTM D - 5147 1991 Test Method for Sampling and Testing Modified Bituminous Sheet Materials
ASTM E - 108 Test Methods for Fire Test of Roof Coverings
ASTM B69-98a Standard Specification for Zinc Sheet.

1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements. Include data substantiating that materials comply with the minimum specified requirements including rubber content, low temperature flexibility, tensile strength, tear strength, and amount of recycled content (post consumer and post industrial).

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B. Samples: Submit four (2) samples of the following:

1. Cap Sheet

2. SBS Modified Base Sheet

C. Specimen Warranty: Provide an unexecuted copy of the 20 year No Dollar Limit water tight warranty covering every part of the Built Up Roofing system specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner.

D. Any material submitted as equal to or better than the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. This report shall show that the submitted equal meets the Design and Performance criteria in this specification.

E. Wind uplift calculation. Provide CA structural II stamped wind uplift calculation per ASCE 7-10. Uplift calculation shall be provided by the roofing system manufacturer's engineering department.

F. Substitution requests submitted without licensed engineer stamp will be rejected for non-conformance.

1.5 SUBMITTALS FOR INFORMATION

A. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.

B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

C. Manufacturer's Certificate: Certify that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

D. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.

E. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.

F. Written certification from the roofing system manufacturer certifying the applicator is currently authorized for the installation of the specified roof system.

G. Design Wind Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-10, Method 2 for Components and Cladding, sealed by a registered professional structural engineer employed by the system manufacturer as a full-time staff engineer. In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.

H. Qualification data for firms and individuals identified in Quality Assurance Article below.

I. Notarized statement from the Roofing System Manufacturer, signed by an Officer of the Corporation with the Corporate Seal affixed there to stating that the Roofing System Manufacturer will provide field inspections on a daily basis during the entire period of installation until all construction is completed and to be performed by a full time employee of the manufacturer at no additional cost to the owner.

1.6 CONTRACT CLOSEOUT SUBMITTALS

A. General: Comply with Requirements of Division 01 Section - Closeout Submittals.

B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.

C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.

D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

E. Demonstration and Training Schedule: Provide a schedule of proposed dates and times for instruction of Owner's personnel in the maintenance requirements for completed roofing work. Refer to Part 3 for additional requirements.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Installer (Roofing) shall be specializing in modified bituminous roof application with minimum 5 years experience and who is certified by the roofing system manufacturer as qualified to install manufacturer's roofing materials.

B. It is the intent of this specification to provide a roof system with an external fire rating. The descriptions given below are general descriptions. The insulation, recovery board, and

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other components shall be as required by the membrane manufacturer to provide a Class A fire resistance rating.

C. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Forman on the job site during all phases of modified bituminous sheet roofing work and at any time roofing work is in progress: proper supervision of workmen shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.

D. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction.

E. Disqualification of Bidders: A Bidder can be disqualified by the Owner's representative or Owner for any of the following reasons, but not limited to:

1. The failure to attend the Pre-Bid conference at the time and place so described under Bidding Dates.

2. Incorrect use of the "Proposal" as provided by the Owner's representative/Owner. Any changes in said format shall be accepted by the Owner's representative/Owner only when requested and approved in writing prior to the bid opening. Changes in the Proposal after the opening of the bids will not be accepted.

3. Lack of proficiency as shown by past work or incomplete work under other contracts which, in the judgment of the Owner's representative/Owner, might hinder or prevent the prompt completion of additional work if so awarded or any involvement in any legal actions which relate to past or present performance. This includes, but is not limited to, law suits, court appointed actions, and/or ongoing litigation.

G. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

H. Pre-application Roofing Conference: Approximately 2 weeks before scheduled commencement of modified bitumen sheet roof system and associated work, meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in the around roofing that must precede or follow roofing work (including mechanical work if any), Owner's representative/Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, test agencies, and governing authorities. Objectives to include:

1. Review foreseeable methods and procedures related to roofing work.

2. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.

3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.

4. Review roofing systems requirements (drawings, specifications, and other contract documents).

5. Review required submittals, both completed and yet to be completed.

6. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Review required inspection, testing, certifying, and material usage accounting procedures.

8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).

9. Record (contractor) discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

10. Review notification procedures for weather or non-working days.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused rolled goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck.

1.9 MANUFACTURER'S INSPECTIONS

A. When the project is in progress, the Roofing System Manufacturer will provide the following:

1. Keep the Owner's representative informed as to the progress and quality the work as observed.

2. Provide job site inspections a minimum of three days a week.

3. Report to the Owner's representative in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

4. Confirm, after completion of the project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.10 PROJECT CONDITIONS

A. Weather Condition Limitations: Do not apply roofing membrane during inclement weather or when a 40% chance of precipitation is expected.

B. Do not apply roofing insulation or membrane to damp deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

D. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

1.11 SEQUENCING AND SCHEDULING

A. Sequence installation of modified bituminous sheet roofing with related units of work specified in other sections to ensure that roof assemblies, including roof accessories, flashing, trim, and joint sealers, are protected against damage from effects of weather, corrosion, and adjacent construction activity.

B. All work must be fully completed on each day. Phased construction will not be accepted.

1.12 WARRANTY

A. Membrane Manufacturer upon completion of installation, and acceptance by the Owner and Owner's representative, the manufacturer will supply to the Owner a 20 year labor and material warranty.

B. Contractor will submit a minimum of a two year warranty to the membrane manufacturer with a copy directly to Owner.

1.13 DESIGN AND PERFORMANCE

A. Uniform Wind Uplift Load Capacity

1. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria. Attachment shall be installed exactly as given in Part 3. (To be included with bid documents)

a. Design Code: ASCE 7-10, Method 2 for Components and Cladding.
b. Category III Building with an Importance Factor of 3.0
c. Wind Speed: 115 MPH
d. Exposure Category: C

PART 2 – PRODUCTS

2.1 GENERAL

A. Material Basis of Design per: The Garland Company or approved equal, Jay Mulligan, (415) 971-2739.

B. Substitutions as allowed per Division 1 General Requirements

C. Any item or materials submitted as an alternate to the manufacturer specified must comply in all respects as to the quality and performance, including job site investigation of the brand name specified. The Owner's representative/Owner shall be the sole judge as to whether or not an item submitted as an equal is truly equal. Should the contractor choose to submit on the equal basis, he shall assume all risk involved, monetary or otherwise, should the Owner's representative/Owner find it unacceptable.

2.2 ROOFING

A. Materials: insulation or base sheet, modified base sheet, and modified capsheet membrane and surfacing.

1. Base ply: the smooth surfaced modified membrane will be: HPR SA FR Base, SBS modified base sheet designed for use as the initial underlayment .

2. Modified membrane: Stressply SA FR Mineral. Dual reinforced, fire resistant, mineral-surfaced self adhered SBS modified bitumen.

3. Base flashing base ply: HPR SA FR Base.

4. Flashing capsheet: 135 mil mineral surfaced modified membrane.

2.3 MODIFIED BITUMEN MEMBRANE PREFORMANCE REQUIREMENTS

A. Tensile Strength, ASTM D 5147
   1. 2 in/min. @ 73.4 ± 3.6 °F MD 180 lbf/in XD 180 lbf/in
B. Tear Strength, ASTM D 5147
   1. 2 in/min. @ 73.4 ± 3.6 °F MD 250 lbf XD 250 lbf
C. Elongation at Maximum Tensile, ASTM D 5147
   1. 2 in/min. @ 73.4 ± 3.6 °F MD 3.5% XD 3.5%
D. Low Temperature Flexibility, ASTM D 5147, Passes -30 degreesF (-34

2.4 BITUMINOUS MATERIALS

A. SA Primer: V.O.C. compliant, ASTM D-1475.

B. Asphalt Roofing Mastic: V.O.C. compliant, Flashing bond, ASTM D-1475, Type II.

2.5 RELATED MATERIALS

A. Caulking and sealant: Tuff-Stuff urethane caulking.

B. Cover board: ¼" Densdeck Prime by Georgia Pacific.

2.6 SURFACINGS

A. White Elastomeric Roof Coating: Energy Star approved Pyramic Plus:

   1. Reflectance 81%

PART 3EXECUTION

3.1 EXAMINATION

A. Examine substrate surfaces to receive modified bitumen sheet roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing modified bitumen roofing system.

B. Insurance/Code Compliance: Where required, install and test modified bitumen roofing system to comply with governing regulations and specified insurance requirements.

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C. Protect other work from spillage of modified bitumen roofing materials, and prevent liquid materials from entering or clogging drains and conductors. Replace or restore other work damaged by installations of modified bituminous roofing system work.

D. Coordinate installing roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut offs at end of each day's work to cover exposed ply sheets with two (2) plies of #15 organic felt set in mastic and with joints and edges sealed with roofing cement. Remove cut offs immediately before resuming work.

E. Substrate Joint Penetrations: Prevent bitumen from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

H. Apply roofing materials as specified herein unless recommended otherwise by manufacturer's instructions. Keep roofing materials dry before and during application. Do not permit phased construction. Complete application of roofing plies, modified sheet and flashing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day.

3.4 INSULATION INSTALLATION

A. Not Applicable.

3.5 BASE PLY INSTALLATION

A. Base ply: Install base ply shingled uniformly to achieve one ply throughout over the prepared substrate. Shingle in proper direction to shed water on each area of roof.

C. Stagger end laps twelve inches minimum.

D. Extend ply two inches beyond top edges of cants at wall and projection bases.

E. Install base flashing ply to all perimeter and projections details.

3.6 MODIFIED MEMBRANE APPLICATION

A. Starting at the low point, torch apply StressPly in the desired position.

B. Care should be taken to eliminate air entrapment under the membrane.

C. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.

D. Subsequent rolls of modified shall be installed across the roof as above with a minimum of 4" side laps and 8" end laps. The end laps shall be staggered. The modified membrane shall be laid in the same direction as the underlayers, but the laps shall not coincide with the laps of the base layers. Adhere all end laps with mastic.

E. Extend membrane 2” beyond top edge of all cants in full moppings of the specified asphalt as shown on the drawings.

F. Seal top of membrane at end of each day.

G. Base and should be installed same day.

3.7 FLASHING MEMBRANE APPLICATION (GENERAL)

A. All curb, wall and parapet flashings shall be sealed with an application of mastic and mesh on a daily basis. No condition should exist that will permit moisture entering behind, around, or under the roof or flashing membrane.

B. Prepare all walls, penetrations and expansion joints to be flashed and where shown on the drawings, with asphalt primer at the rate of one gallon per 100 square feet Allow primer to dry tack free.

C. The modified membrane will be used as the flashing membrane and will be adhered to an underlying base flashing ply and nailed off 8” O.C. at all vertical surfaces. Over 12" the modified membrane will be 80 mils with a mineral cap sheet installed over the top.

D. The entire sheet of flashing membrane must be solidly adhered to the substrate.

E. Seal all vertical laps of flashing membrane with a three course application of Flashing Bond and fiberglass mesh.

F. Counter flashing, cap flashings, expansion joints, and similar work to be coordinated with modified bitumen roofing work are specified in other sections.

G. Roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with modified bituminous roof system work are in other sections.

H. Ensure all flashing are nailed off and sealed with a three course application of mastic and mesh.

3.8 APPLICATION OF SURFACING

A. Prior to installation of surface, obtain approval from manufacturer as to work completed.

B. Pyramic Plus:

1. Existing roof surface must be sound and free of defects. All defects must be repaired with a suitable patching material.

2. Loose materials, standing water, debris, oil, and other contaminants may prevent full adhesion of the coating and must be removed.

3. Pyramic Base Coat can be applied by brush, or roller.

4. Apply at a rate of 1.5 gallons per 100 square feet depending on substrate.

5. Allow Base Coat to dry for 8 hours before applying Pyramic Top Coat. Must be completed within 72 hours.

6. Apply Pyramic Top Coat at a rate of 1-1.5 gallons per 100 square feet.

3.9 CLEANING

A. Remove drippage of bitumen from all walls, windows, floors, ladders, and finished surfaces.

B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.

3.10 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with the performance of the roofing system.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each parting attending.

C. The Roofing System Manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the Roofing Contractor at a negotiated price.

D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace (as required) deteriorated or defective work found at time above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. The Contractor is to notify the Owner upon completion of corrections.

G. Following the final inspection, acceptance will be made in writing by the material manufacturer.

END OF SECTION

SECTION 07 60 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated on drawings and as follows:

1. Metal edge system with continuous cleats.

1.2 RELATED REQUIREMENTS

A. Section 07 5114 – Modified Bitumen

1.3 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process

D. ASTM B 32 - Standard Specification for Solder Metal.

E. ASTM B486 Paste Solder

F. ASTM B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

G. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

H. ASTM D 2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

I. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

J. FS QQ-L-201 Specification for Lead Sheet

K. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening

methods, flashings, terminations, and installation details.
1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
2. Indicate type, gauge and finish of metal.

B. Product data: Provide manufacturer's specification data sheets for each product :
1. Metal material characteristics and installation recommendations.
2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specific can be approved.

C. Manufacturer’s installation instructions for reglets.

D Samples: Submit two samples 8x10 inch in size illustrating metal finish color.
1. Submit two samples, 12 x 12 inch in size illustrating typical external corner, internal corner, and valley, junction to vertical dissimilar surface, material and finish.

E. Certification:
1. Submit roof manufacturer's certifications that metal fasteners furnished are acceptable to roof manufacturer.
2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.
3. Submit certification that metal and fastening system furnished is Tested and Approved by Factory Mutual for 1-90 Wind Up-Lift Requirements.

F. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.

G. Proof of fabricator and installer qualifications.

H. ANSI-SPRI ES-1 test results for all coping and edge metal.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements, except as otherwise indicated.
1. Factory Mutual Loss Prevention Data Sheet 1-49 windstorm resistance: 1-90.

B. Manufacturer's Warranty: Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.

C. Contractor's Warranty: The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be water-tight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Aluminum: ASTM B209, minimum thickness 0.050 and greater as required by referenced standards for specific applications.

2.2 ACCESSORIES

A. Fasteners:
   1. Stainless steel screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
   2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.

B. Plastic Cement: ASTM D 4586, Type I.

2.3 FABRICATION - GENERAL

A. Fabricate in accordance with referenced standards. Form sections true to shape, accurate in size, square, and free from distortion or defects. Form pieces as recommended by SMACNA standard for conditions required.
   1. Provide reinforcements and supports as required for secure anchorage.
   2. Make joints rigid. Seams mechanically strong and soldered or sealed to make watertight
   3. Fabricate corners in one piece with legs extending 30-inches each way to field joint. Lap, rivet, and solder or seal corner seams watertight.
   4. Turn up "end dam" flanges at ends of opening sill flashing pieces, lap with wall flashing and membranes to shed water.
   5. Fabricate cleats of same material as sheet, minimum 3/4 inches wide, interlockable with sheet.
   6. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   7. Solvent clean all sheet metal. Coat surfaces to be in contact with roofing or otherwise concealed with specified asphaltic paint; 0.015-inch minimum uniform thickness.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.4 EDGE METAL SYSTEM AND METAL COPING SYSTEM

A. R-mer Edge Coping system by The Garland Company or approved equal.

1. ANSI SPRI ES-1 tested and certified.

2.5 ROOF-RELATED SHEET METAL AND FLASHINGS

A. Roof-Related Sheet Metal and Flashings: As indicated, as specified in related sections, as required by roofing material manufacturers and referenced standards. Coordinate work of this section with related sections. Provide complete systems without conflict or omission.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

D. Field measure site conditions prior to fabricating work.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction. Conform to referenced standards. Make metal joints watertight.

B. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual 1-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.

C. All accessories or other items essential to the completeness of sheet metal installation and water tight envelope of the building, whether specifically indicated or not, shall be provided.

D. Reglets: Install in accordance with manufacturer's installation instructions.

E. Metal fascia and copings shall be secured to wood nailers at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures.

F. Install Sheet Membrane Waterproofing at closure flanges, under metal copings, caps and platforms; fully adhered, free of voids, blisters and buckling; roll as soon as practical following layout. Minimize exposure time to that period recommended by the manufacturer.

G. Flashing: Joints at 10-foot maximum spacing and at 2-1/2-feet from corners. Butt joints with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps.

H. Flanged flashings and roof accessories: Set on continuous sealer tape. Nail flanges through sealer tape and at 3-inch maximum spacing.

I. Isolate metal from dissimilar metal with 2 coats of specified asphaltic paint, sealer tape or other approved coating, specifically made to stop electrolytic action.. Use only stainless steel fasteners to connect isolated dissimilar metals.

J. Joints, fastenings, reinforcements and supports: Sized and located as required to preclude distortion or displacement due to thermal expansion and contraction. Conceal fastenings wherever possible.

K. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

L. Flexible Flashing Installation:
   1. Prime substrates as recommended by flexible flashing manufacturer, allow to dry.
   2. Install flexible flashings in maximum feasible lengths to minimize lap joints.
   3. Peel release paper from roll to expose rubberized asphalt and position flashing to center over joint location before applying. Move along opening or joint, being careful to put flashing as evenly as possible over the opening. Avoid fishmouths.
   4. Press flashing firmly into place with heavy hand pressure . Ensure continuous and intimate contact with substrate.
   5. If wrinkles develop, carefully cut out affected area and replace as outlined above.

M. Apply plastic cement compound between metal flashings and felt flashings.

N. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

O. Seal prefinished metal joints watertight.

P. Solder other metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

Q. Connect downspouts and rain water leaders to storm sewer system. Seal connection watertight.

R. Install hatches and ladders per manufacturer's recommendations.

X. Install roof drains per manufacturer's recommendations.

3.4 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

B. Tolerances
   1. Exposed surfaces: Free of dents, scratches, abrasions, or other visible defects; clean, ready for painting.
   2. Set flashings and sheet metal to straight, true lines with exposed faces aligned in plane as indicated.

3.5 SHOP FABRICATED SHEET METAL

A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.

B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.

C. Hem exposed edges.

D. Angle bottom edges of exposed vertical surfaces to form drip.

E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.

F. Joints for gravel stop fascia system, cap flashing, and surface-mount counterflashing shall be formed with a 1/4" opening between sections. The opening shall be covered by a cover plate or backed by an internal drainage plate formed to the profile of fascia piece. The cover plate shall be embedded in mastic, fastened through the opening between the sections and loose locked to the drip edges.

G. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.

END OF SECTION

SECTION 07 63 00
GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel gutters and downspouts.

B. Steel pipe downspouts.

C. Precast concrete splash blocks and sheet metal splash pans.

1.2 REFERENCES

Contractor's work shall comply with the following standards as applicable. Manufactured items are to be fabricated to these same standards.

The following standards (and publications) are applicable to the extent referenced in the text. The most recent of these standards is implied, unless otherwise stated.

A. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.

B. ASTM A653 - Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM A755 - Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

D. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

E. SMACNA - Architectural Sheet Metal Manual.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Shop Drawings of metal items indicating profiles, jointing, terminations, and installation details. Indicate type and spacing of fasteners.

C. Submittal of specific plates from the SMACNA Architectural Sheet Metal Manual constitutes acceptable documentation of installation details.

D. Submit Product Data for pre-coated galvanized steel.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal Work with five years minimum experience.

B. Perform Work in accordance with SMACNA standard details and requirements.

1.5 STORAGE AND HANDLING

A. Store products under provisions of Section 01 60 00.

B. Stack preformed material to prevent twisting, bending, or abrasion and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining or damage.

1.6 WARRANTY

A. Provide manufacturer's 20-year warranty against defective materials and finish.

B. Provide installer's 2-year warranty coverage for water tightness and integrity of seals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel: ASTM A653, Grade 33, G90 zinc-coating in accordance with ASTM A924; thickness as specified.

B. Steel Pipe: ASTM A53, Grade B, Schedule 40 steel pipe, standard weight, Type S, one piece without joints, galvanized according to ASTM A53; 1.8 ounces per square foot.

2.2 COMPONENTS

A. Facia Gutters: 16 gauge or as indicated. Formed to profiles indicated. Include downspout outlet and integral straps as part of the assembly.

B. Ogee Gutters: 22 gauge or as indicated, die-formed to profiles indicated.

C. Steel Pipe Downspouts: Fabricate from Schedule 40 steel pipe, and other steel stock as indicated, all full penetration welded into one assembly, then hot-dip galvanized.

D. Sheet Metal Downspouts: Not Used.

E. Splash Blocks: Pre-cast concrete type, of sizes and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

F. Splash Pans: Fabricated from same metal as gutters. Tack down to roofing surface with asphalt cement.

2.3 ACCESSORIES

A. Anchorage Devices: Meet SMACNA requirements.

B. End Caps, Downspout Outlets, Rain Diverters, Straps, Support Brackets, Joint Fasteners. Profiled to suit gutters and downspouts.

C. Protective Backing Paint: Zinc chromate alkyd at all concealed surfaces.

D. Gutter Expansion Joints: Provide at every 50' of length or as recommended by SMACNA. Submit sketches of detail.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated.

B. Field measure site conditions prior to fabricating Work.

C. Fabricate with required connection pieces.

D. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance.

E. Hem exposed edges of metal.

F. Seal metal joints.

G. Fabricate gutter and downspout accessories; seal watertight.

H. Form splash pans to size as detailed with rolled edges.

2.5 SHOP FINISHING

A. Shop prepare and prime exposed ferrous metal surfaces.

B. Back-paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mils.

C. Site paint exposed to view metal surfaces as specified in Section 09 91 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work. Contractor to correct deficiencies in the surfaces at own expense.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Provide concealed solid blocking at all steel pipe downspout brackets.

B. Coordinate layout of downspouts with site conditions and features on the building not shown in the building elevations.

C. Install gutters, downspouts, and accessories in accordance with SMACNA requirements.

D. Coordinate installation of sheet metal gutters with steel pipe downspouts.

E. Join lengths with seams sealed watertight. Flash and seal gutters to downspouts and accessories.

F. Seal metal joints watertight.

G. Set splash blocks under downspouts. Tack down all metal rooftop splash pans to roof surface with asphalt cement.

H. Coordinate downspouts connecting to the storm drain system with other Work.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

B. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

C. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

D. Sealant joints in fire-resistance-rated construction.

E. Fireproof firestopping and firesafing materials and accessories.

F. Openings between exterior curtainwall and edge of floor slabs.

G. Opening between top tracks of walls and connecting floor or roof assemblies.

H. Openings at each floor level in shafts and stairwells.

1.2 REFERENCES

A. ASTM C920 - Elastomeric Joint Sealants.

B. ASTM C1193 - Use of Joint Sealants.

C. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E119 - Method for Fire Tests of Building Construction and Materials.

E. UL - Fire Hazard Classifications.

F. UL 1479 - Fire Tests of Through-Penetration Firestops.

G. 40 CFR Part 763, Subpart F (7-1-90 Edition) - Asbestos Hazardous Emergency Response Act, Friable Asbestos - Containing Materials in Schools.

1.3 DEFINITION

A. Firestopping (Firesafing): A sealing or stuffing material or assembly placed in spaces between building materials to arrest the movement of smoke, heat, gases, or fire through wall or floor openings.

1.4 SYSTEM DESCRIPTION

A. F-Rated Through-Penetration Firestop Systems: F-ratings as required according to UL 1479, but not less than that equaling or exceeding fire resistance rating of assembly penetrated where the following conditions exist:

1. Penetrations larger than 4 inch nominal pipe size or 16 square inches in overall cross-sectional area.

B. T-Rated Through-Penetration Firestop Systems: T-ratings, in addition to F-ratings, as required according to UL 1479, where the following conditions exist:

1. Through-penetrations of fire-rated walls above corridor ceilings which are not part of a fire-resistive assembly.

2. Through-penetrations of fire-rated walls below any ceiling.

3. Penetrations larger than 4 inch nominal pipe size or 16 square inches in overall cross-sectional area.

C. Penetrations not larger than 4 inch nominal pipe size or 16 square inches in overall cross-sectional area shall have the annular space between the penetrating item and the wall/floor assembly filled with a material which will prevent passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E119 under a minimum positive pressure differential of 0.01-inch water column for the time period at least equal to the fire resistance rating of the wall/floor assembly.

D. Surface Burning: ASTM E84 with a flame spread/smoke developed rating of 25/450.

E. Firestop all interruptions and terminations of fire-rated assemblies.

F. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

G. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

H. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit manufacturer’s Shop Drawings for each type of firestop or smoke seal required by the Project. Shop Drawings shall indicate the detailing of all necessary anchorages, reinforcements and fastenings required.

C. Product Data: Provide product characteristics, performance and limitation criteria.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Certification: Submit firestopping manufacturer's certification that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

1.6 QUALITY ASSURANCE

A. Through-penetration firestop systems shall correspond to through-penetration firestop system designations listed in the UL Fire Resistance Directory.

B. Firestopping and smoke seal Work shall be performed by an installer trained or approved by the firestop or smoke seal manufacturer. Equipment used shall be in accordance with firestop or smoke seal manufacturer's written installation instructions.

1.7 REGULATORY REQUIREMENTS

A. Conform to Title 24, Part 2 and UL requirements for fire-resistance ratings and surface-burning characteristics.

B. Firestopping products shall contain no detectable asbestos as determined by 40 CFR, Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate Work with related trades.

B. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed in accordance with manufacturer's instructions and regulatory requirements.

C. Do not cover up installations that will become concealed behind other construction until Owner's Representative and authorities having jurisdiction, if required, have examined each installation.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original unopened packages fully identified with manufacturer's name, trade name and UL label.

1. Leave seals unbroken and labels intact until time of use.
2. Remove from job site any rejected or damaged packages found unsuitable for use.

B. Store materials in a dry place, off of the ground or floor, and away from other material subject to sweating or attraction of moisture or dampness.

C. Provide ventilation in areas to receive solvent cured materials.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide firestopping components that are compatible with each other, substrates of openings, and items penetrating firestopping.

B. Provide accessories for each firestopping system that are needed to comply with designated fire-resistance-rated systems specified by firestopping manufacturer.

2.2 ACCEPTABLE MANUFACTURERS

A. Hilti Construction Chemicals Inc.

B. Minnesota Mining and Mfg. Co.

C. Tremco.

D. United States Gypsum Co.

E. Bio Fireshield, Inc.

F. Dow-Corning Corp.

G. International Protective Coatings (IPC.)

H. Substitutions: Under provisions of Section 01 62 00.

2.3 FILL MATERIALS

A. General: Firestopping and smoke seal materials shall be asbestos free.

1. The F rating must be a minimum of 1 hour, but not less than the fire resistance rating of the assembly being penetrated, when tested per ASTM E84.

2. Materials being applied in openings between elements of differing fire ratings shall conform to the most restrictive rating.

3. Fire tests shall be conducted with a minimum positive pressure differential of 0.03 inches of water column.

4. Material shall be noncombustible, with flame spread of 25 or less, and smoke development of 50 or less, when tested in accordance with ASTM E84.

B. Firestop or Smoke Seal Mortar: Single-component Portland cement fly ash mortar, requiring no special supports or anchoring devices to pass water hose stream tests.

C. Intumescent:

1. Wrap: Single-component, elastomeric sheet with aluminum foil on one side.

2. Calk: Water-based latex calk per UL1479.

D. Vinyl Compound: Vinyl-based powder product mixed on site with water to produce a paintable compound with flame-spread and smoke-developed rating of 0 per ASTM E84.

E. Silicone Foam: Two-component, silicone based liquid elastomer that, when mixed, expands and cures in place to produce a flexible nonshrinking foam.

F. Firestop or Smoke Seal Sleeve: Prefabricated device used around plastic pipes in fire-rated floors and walls. The sleeve shall be made of a steel collar lined with an intumescent material.

G. Fiber Stuffing: Mineral fiber stuffing with a minimum density of 3.5 lbs/cu ft.

H. Mineral fiber board, mineral fiber matting, and mineral fiber putty-forming and damming materials shall be used to contain the fluid material mixture prior to and during filling of penetrations and voids.

1. Fire tested and functionally approved forming materials may be left in place to become an integral part of the formed penetration seal.

2. Combustible forming and damming materials may be used for containment during installation of materials only, and must be removed from the final completed penetration seal system.

I. Provide primers as required which conform to manufacturer's recommendations for various substrates and conditions.

2.4 JOINT SEALANTS

A. Manufacturer's standard chemically-curing elastomeric sealant that complies with ASTM C920.

B. Provide selections from manufacturer's full range of colors.

C. Single-Component, Neutral Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related use NT; and joint substrate related uses M, G, A, and O, as applicable to substrate assembly condition.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are suitable for installation of products.

B. Verify openings are ready to receive the Work of this Section.

C. Notify the Contractor in writing, with copy to Architect, of conditions detrimental to the timely completion of the Work.

D. Do not proceed with Work until all unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove laitance and form release agents from concrete.

C. Remove incompatible materials which may affect bond.

D. Install backing materials to arrest liquid material leakage.

3.3 APPLICATION OF THROUGH-PENETRATION FIRESTOPS

A. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

B. Comply with through-penetration firestop manufacturer's installation instructions and Drawings pertaining to products and applications required.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce shapes and depths required to achieve fire ratings.

D. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop system.

E. Apply primer and materials in accordance with manufacturer's instructions.

F. Apply firestopping material in sufficient thickness to achieve rating.

G. Install firestops or smoke seals with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal.

H. Install fire-resistant filler in openings where indicated.
   1. Dam bottom of vertical openings and one side of horizontal openings with temporary containment forms or, where required to achieve fire-resistance ratings, provide permanent mineral composition board forms.
   2. On horizontal penetrations, provide partial face containment forms where required for material displacement.

   3. Allow installed fillers to cure, and remove temporary forms; trim ragged edges with sharp knife; inspect and fill voids with additional filler to form uniform thickness of filler.

3.4 APPLICATION OF FIRE-RESISTIVE JOINT SEALANT

A. Comply with ASTM C1193 and manufacturer's installation instructions and Drawings pertaining to products and applications required.

B. Install joint fillers to provide support and at a position required to produce depth to joint widths that allow development of fire-resistance rating required.

C. Install sealant to completely fill recesses provided. Install sealant at same time as joint filler.

D. Tool non-sag sealants after application to form smooth uniform bead to configuration required to produce fire-resistance rating.

E. Spillage: Do not allow sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

F. Recess exposed edges of gaskets and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.

G. Tool or trowel exposed surfaces. Remove excess firestop or smoke seal material promptly as Work progresses and upon completion.

H. Apply firestop or smoke seal material at penetrations of insulated piping after the insulation is installed.

1. The material used shall have been tested for compatibility and rating in conjunction with the use of the insulation material being used.

2. Calcium silicate, or other pipe insulation, may be substituted for fiberglass pipe insulation through the sleeve, if the insulation is part of an assembly which meets the requirements specified for firestopping or smoke sealing.

I. Firestopping or smoke sealing materials for filling voids in floors having openings of 4 inches or greater, shall be installed to support the same load as the floor system, unless the area is protected by a permanent barrier preventing loading or traffic on the firestopped or smoke sealed area.

3.5 FIELD QUALITY CONTROL

A. Do not cover up installations that will become concealed behind other construction until Owner's Representative and authorities having jurisdiction, if required, have examined each installation.

B. Where deficiencies are found, repair or replace firestopping to required condition.

3.6 CLEANING

A. Clean Work under provisions of Section 01 77 00.

B. Clean adjacent surfaces of firestopping materials.

3.7 CURING AND PROTECTION OF FINISHED WORK

A. Cure firestopping and smoke seal materials in compliance with manufacturer's instructions and recommendations.

B. Installer shall advise Contractor of procedures required for protection of firestopping and smoke seals during remaining construction period.

C. Protect finished Work under provisions of Section 01 77 00.

D. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00
JOINT SEALERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant and backing.

1.2 SUMMARY OF SEALANT LOCATIONS

A. Joints in Horizontal Surfaces:

1. Expansion and isolation joints in cast-in-place concrete slabs.
2. Expansion and isolation joints in masonry paving.
3. Joints in precast concrete paving units.
4. Joints in stone paving units.
5. Control and expansion joints in ceramic and quarry tile.
6. Control and expansion joints in soffits, ceilings and overhead surfaces.
7. Joints on underside of precast beams and planks.
8. Perimeter joints in exterior openings.
9. Joints between ceiling surfaces and frames for doors and windows.
10. Joints in flashing and sheet metal.
11. Perimeter joints of toilet fixtures.
12. Acoustical isolation joints between head and sill of walls and floor and ceiling surfaces.
13. Joints between countertops and wall surfaces.
14. Joints in skylights and framing.
15. Joints between thresholds and floors.
16. Isolation joints in plaster soffits and ceilings.
17. Joints between dissimilar materials and those listed above.

18. Other joints as indicated.

B. Joints in Vertical Surfaces:

1. Expansion and isolation joints in cast-in-place concrete.
2. Expansion and isolation joints in masonry.
3. Joints in precast concrete.
4. Expansion and isolation joints in stonework.
5. Control and expansion joints in ceramic and quarry tile.
6. Perimeter joints in exterior openings.
7. Joints in flashing and sheet metal.
8. Perimeter joints of toilet fixtures.
9. Acoustical isolation joints of walls.
10. Joints between cabinets and walls.
11. Joints between wall surfaces and door and window frames.
12. Joints in skylights and framing.
13. Isolation joints in plaster walls.
14. Joints between dissimilar materials and those listed above.
15. Other joints as indicated.

1.3 REFERENCES

A. ASTM C834 - Latex Sealing Compounds.

B. ASTM C919 - Practices for Use of Sealants in Acoustical Applications.

C. ASTM C920 - Elastomeric Joint Sealants.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants.

E. ASTM D217 - Cone Penetration of Lubricating Grease.

F. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

G. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, solvent Release Type.

H. SWRI - (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Product Data indicating sealant chemical characteristics, performance criteria, limitations, and color availability.

C. Submit two 4-inch long Samples illustrating colors selected.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.

B. Applicator: Company specializing in applying the Work of this Section with minimum three years documented experience, approved by sealant manufacturer.

C. Conform to Sealant, Waterproofing, and Restoration Institute (SWRI) requirements for materials and installation.

D. Perform Work in accordance with ASTM C1193.

E. Perform acoustical sealant application work to provide maximum STC values in accordance with ASTM C919.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Do not install sealant when temperature is less than 40 degrees F.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.7 WARRANTY

A. Provide sealant manufacturer’s 5-year warranty against defects in materials.

B. Include coverage for installed sealants and accessories which fail to achieve air and water seal and exhibit loss of adhesion or cohesion or do not cure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers and products are listed for each sealant type.

B. Substitutions: Under provisions of Section 01 62 00.

2.2 SEALANTS

A. Type A - Acrylic Latex: One-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.

1. Tremco Inc., Acrylic Latex Caulk.

2. Bostik Construction Products Division, “Chem-Calk 600”.

3. Pecora Corporation, “AC-20”.

B. Type B - Butyl Sealant: One-part, non-sag solvent-release-curing sealant complying with FS TT-S-001657 for Type 1 and formulated with a minimum of 75 percent solids.

1. Tremco Inc., Tremco “Bitul Sealant”.

2. Bostik Construction Products Division, “Chem-Calk 300”.

3. Pecora Corporation, “BC-158”.

C. Type C - Silicone Sealant: One-part nonacid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

1. Dow Corning Corp., “Dow Corning 790”.

2. General Electric Co., “Silpruf”.

3. Tremco, Inc., “Spectrum 1”.

4. Pecora Corp., “864” or “890”.

D. Type D - Neutral-Curing Silicone Sealant: One part medium modulus neutral-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.

1. Dow Corning Corp., “Dow Corning 795”.

2. General Electric Co., “Ultraglaze 4000”.

3. Tremco, Inc., “Spectrum 3”.

4. Pecora Corp., “895”.

E. Type E - One-Part Mildew-Resistant Silicone Sealant: Complying with ASTM C920, Type S, Grade NS, Class 25.

1. Dow Corning Corp., “Dow Corning 786”.

2. General Electric Co., “Sanitary 1700”.

3. Rhone-Poulene Inc., “Rhodorsil 6 B White”.

4. Tremco, Inc., “Proglaze White”.

5. Pecora Corp., “863” or “898” White.

F. Type F - Multi-Part Pourable Sealant: Complying with ASTM C920, Type M, Grade P, Class 25. Shore A hardness +40.

1. Tremco, Inc., “HPL”.

2. Mameco International, Inc., “Vulkem 255”.

3. Pecora Corp., “Dynatred” or “Urexpan NR-200”.

4. Sika Corporation, “Sikaflex 2C NS/SL”.

5. W.R. Meadows, “Pourthane”.

G. Type G - Acoustical Sealant: Nondrying, nonhardening permanently flexible conforming to ASTM D217.

1. Pecora Corp., “BA-98 Acoustical Sealant”.

2. Tremco, Inc., “Tremco Acoustical Sealant”.

3. United States Gypsum Co., “Sheetrock Acoustical Sealant”.

H. Sound and Fire Protective Rated Moldable Putty Pads as wall opening protective materials when code required in fire-rated walls.

1. Tremco, Inc., TREMstop “MP Putty Pads”.

2. 3M Inc., “3M Fire Barrier Moldable Putty Pads MPP+.”

3. Hilti Co., “CFS-P PA Fire Putty Pad”.

2.3 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that joint openings are ready to receive Work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing substrate.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions. Prime if recommended by manufacturer.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with ASTM C1193.

E. Protect elements surrounding the Work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints concave unless otherwise detailed.

3.4 CLEANING AND REPAIRING

A. Clean work under provisions of Section 01 70 00.
B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by Work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

3.6 SCHEDULE

Type	Location	Color
Type A - Acrylic Latex Cure	All interior joints not otherwise scheduled	To match adjacent surfaces
Type B - Butyl	Under thresholds	Black
Type C - One-Part Nonacid Curing Silicone	Exterior door, entrance & window frames. Exterior & Interior vertical joints in concrete & masonry. metal flashing	Grey at concrete. All other to match adjacent material.
Type D - Neutral-Curing Silicone	Joints within glass and glazing	Translucent
Type E - Mildew-Resistant Silicone	Interior joints in ceramic tile and at plumbing fixtures	To match adjacent material
Type F - Multi-part Pourable Urethane	Exterior & interior joints in horizontal surfaces of concrete; between metal & concrete masonry and mortar	To match adjacent material
Type G - Acoustical Sealant	In sound rated walls between stud track/runner and adjacent construction. Between outlet boxes and gypsum board.	White
Type H - Sound and Fire Protective Rated Moldable Putty Pads	At fire-rated wall openings when code required, such as electric boxes. In sound rated walls at electric boxes.	Red

END OF SECTION

SECTION 08 13 13
HOLLOW METAL DOOR AND FRAMES

PART 1- GENERAL

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.

2. SUMMARY

   a Related Sections:

      1 Division 09 90 00 “Painting" for field painting hollow metal doors and frames.

   b Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

      1 ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
      2 ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
      3 ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
      4 ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
      5 ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
      6 ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
      7 ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
      8 ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
      9 ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
      10 ANSI/BHMA A156.15 - Hardware Preparation in Steel Doors and Frames.
      11 ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
      12 ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
      13 ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
      14 NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
      15 UL 10C - Positive Pressure Fire Tests of Door Assemblies.
      16 UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

17 California Building Code and amendments.

3. DELIVERY, STORAGE, AND HANDLING

a Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

b Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

c Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1 Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

4. PROJECT CONDITIONS

a Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

5. COORDINATION

a Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

6. WARRANTY

a Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

b Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2- PRODUCTS

1. MANUFACTURERS

a Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1 CECO Door Products.

2 Curries Company.
3 Security Metal Products.
4 Steelcraft.

2. MATERIALS

a Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

b Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

c Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

3. STANDARD HOLLOW METAL FRAMES

a General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

b Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1 Fabricate frames with mitered or coped corners.
2 Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3 Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
4 Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.]
5 Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.]
6 Frames for Wood Doors: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
7 Frames for Borrowed Lights: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
8 Manufacturers Basis of Design:

a CECO Door Products BQ/BU/DQ/DU/BR/DR Series (Drywall Profile).
b CECO Door Products SQ/SU/SR Series (Masonry Profile).
c Curries Company C/CM/CG Series (Drywall Profile).
d Curries Company M/G Series (Masonry Profile).

c Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

d Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

4. FRAME ANCHORS

a Jamb Anchors:

1 Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2 Stud Wall Type: Designed to engauge stud and not less than 0.042 inch thick.
3 Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.
4 FEMA 361 Storm Shelter Anchors: Masonry T-shaped, wire masonry type, or existing opening type anchors.

b Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

c Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

5. FABRICATION

a Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

b Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

c Hollow Metal Frames:

1 Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2 Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

a Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3 Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4 High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.

5 Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

6 Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.

7 Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.

8 Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

9 Jamb Anchors: Provide number and spacing of anchors as follows:

a Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1 Three anchors per jamb up to 60 inches high.
2 Four anchors per jamb from 60 to 90 inches high.
3 Five anchors per jamb from 90 to 96 inches high.
4 Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5 Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10 Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

d Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 71 00 "Door Hardware."

1 Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2 Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3 Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4 Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

6. STEEL FINISHES

a Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1 Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3- EXECUTION

1. EXAMINATION

a Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

b General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

c Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION

a Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

b Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.

c Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

d Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3. INSTALLATION

a General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

b Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

2 Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

3 Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

c Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1 Non-Fire-Rated Standard Steel Doors:

a Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2 Fire-Rated Doors: Install doors with clearances according to NFPA 80.

4. ADJUSTING AND CLEANING

a Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

b Remove grout and other bonding material from hollow metal work immediately after installation.

c Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer, hardboard or MDF faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Louvers installed in flush wood doors.
5. Light frames and glazing installed in wood doors.

B. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames" for wood doors in steel frames.
2. Division 08 Section "Glazing" for glass view panels in wood doors.
3. Division 08 Section "Door Hardware" for door hardware for flush wood doors and wood frames.

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A208.1 – Wood Particleboard.
2. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
3. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
4. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
5. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
6. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

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1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A or AWS classifications. Include factory finishing specifications.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the wood door supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire protection ratings for fire rated doors.

D. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.

   a. Provide samples for each species of veneer and solid lumber required.
   b. Finish veneer faced door samples with same materials proposed for factory finished doors.

3. Frames for light openings, 6 inches long, for each material, type, and finish required.Cre

E. Warranty: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C (neutral pressure testing according to UL 10B where specified).

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.

2. Temperature Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.

3. Smoke Control Door Assemblies: Comply with NFPA 105.

    1) Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

4. Blocking: Indicate size and location of blocking in 45, 60 and 90 minute mineral core doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

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b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
c. Telegraphing of core construction and delaminating of face in decorative laminate-faced doors.

2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid Core Interior Doors: Life of installation according to manufacturer's written warranty.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Acceptable Manufacturers, Flush Faced Doors
1. Eggers Industries, Inc.
2. Marshfield Door Systems, Inc
3. Algoma Hardwoods, Inc
4. Substitutions: Under provisions of Section 01 25 00.

C. 1. Construction: 5-ply, with face veneer applied vertically over wood veneer cross banding.

2. Flush Interior Door Veneer: Birch for paint grade and natural maple species to match adjacent wood or simulated wood finishes; plain sliced with book matched grain, for transparent clear or stain finish to match existing adjacent doors. Satin sheen. Color as selected by Architect to match other doors on site.

3. ADHESIVES – Exterior and Interior Doors: WI Type I.

D. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.

2. Category B Edge Construction: Provide 20 minute fire rated doors as Category B, with smoke and fire seals (supplied by seal manufacturer) applied to frame for 20 minute openings.

3. Pairs: Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

a. Where required or specified, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

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2.2 CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
3. Blocking: When through-bolted hardware is not used, provide wood blocking in particleboard core doors as follows:

    a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
    b. 5-inch (125-mm) mid-rail blocking, in doors indicated to have exit devices.

        1) Optional Cores for Blocking: Provide doors with either glued-wood-stave or structural-composite-lumber core instead of particleboard core for doors indicated to receive closers and exit devices.

4. Basis of Design:

    a. Graham: PC, PC5

B. Mineral Core Doors:

1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.

2. Blocking: Provide composite blocking with improved screw holding capability approved for use in doors of fire protection ratings indicated as needed to eliminate through-bolting hardware.

3. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

4. Basis of Design: Graham FD.

2.3 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Graham: GPD

B. Interior Solid Core Doors:

1. Match between Veneer Leaves: Book match.

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2. Assembly of Veneer Leaves on Door Faces:

   a. Running Match.

3. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
4. Transom Match: Continuous match.
5. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
6. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
8. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.4 LIGHT FRAMES AND GLAZING

A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:

   1. Wood Species: Same species as door faces.
   2. Profile: Manufacturer's standard lipped profile. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire Rated Doors over 20-minute rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.5 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

   1. Comply with requirements in NFPA 80 for fire rated doors.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

D. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

E. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Grade: Premium.
2. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum windows with fixed and operating sash.

B. Glass and glazing.

C. Operating hardware.

D. Perimeter sealant.

1.2 REFERENCES

A. AAMA 101 - Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Door.

B. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

C. ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.

D. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

E. ASTM E331 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

F. ASTM E547 - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.

G. CCR - California Code of Regulations, Title 24, Part 6, Section 116.

H. CEC - California Energy Commission.

I. FS L-S-125 - Screening, Insect, Nonmetallic.

J. NFRC - National Fenestration Rating Council.

K. NAAMM - National Association of Architectural Metal Manufacturers.

L. SIGMA - Sealed Insulating Glass Manufacturers Association.

1.3 PERFORMANCE REQUIREMENTS

A. Comply with air infiltration, water penetration and structural performance requirements indicated in AAMA 101 for the type, grade and performance class of window units required.

B. Test each type and size of required window unit through a recognized testing laboratory or agency, in accordance with ASTM E330 for structural performance, with ASTM E283 for air infiltration and with both ASTM E331 and ASTM E547 for water penetration.

C. Thermal Performance: Overall U-value of 1.10 as rated in accordance with the National Fenestration Rating councils' (NFRC) Interim U-value Rating Procedure or in accordance with default table method approved by the California Energy Commission (CEC).

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related Work; installation requirements, and details of existing openings.

C. Submit manufacturer's installation instructions.

D. Submit Product Data for each window type specified.

E. Submit two 12 inch square Samples illustrating window frame sections, corner section, mullion section, screen and frame.

F. Submit two Samples of operating hardware.

G. Submit manufacturer's certification and certified test results showing that window units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Label to be permanently affixed to frame listing certified U-value, certifying organization and rating procedure.

B. Label to be temporarily affixed to frame certifying that air infiltration requirements of CCR, Title 24, Part 6, Section 116 have been met.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect window units under provisions of Section 01 87 00.

B. Provide wrapping or strippable coating to protect prefinished aluminum surfaces.

1.7 WARRANTY

1. Manufacturer shall give written warranty to District, stating that manufacturer will replace all aluminum windows that are found to be defective within 10 years of date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Casement Windows: C-HC40 type, grade, and performance class (minimum).

1. Kawneer Company, 8225TL Series, (916) 716-7396.
2. Bonelli Enterprises, 3000T Series, (650) 873-2222.
3. Accepted approved equal.

B. Projected Windows: P-HC40 type, grade, and performance class (minimum).

1. Kawneer Company, 8225TL Series, (916) 716-7396.
2. Bonelli Enterprises, 3000T Series, (650) 873-2222.
3. Accepted approved equal.

C. Fixed Windows: F-HC40 type, grade, and performance class (minimum).

1. Kawneer Company, 8225TL Series, (916) 716-7396.
2. Bonelli Enterprises, 3000T Series, (650) 873-2222.
3. Accepted approved equal.

D. Replacment glazing stop at windows to be reglazed.

1. Bonelli Enterprises, Series 700 with ¾” dual unit glazing.

E. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221, 6063 alloy, T5 or T6 temper.

2.3 FABRICATED COMPONENTS

A. Frames: Sizes as detailed of non-thermally broken, flush glass stops of snap-on type with capped sill ends.

B. Operable Sash Weatherstripping: Window manufacturer's standard, permanently resilient, profiled to effect weatherseal.

C. Operable Sash Hardware: Corrosion resistant; pivot bearings; positive position stop. Provide 5-foot long pole handle for project-in units, one per room, with hanger, located as directed.

E. Fasteners: Stainless steel.

2.4 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As indicated in section 08 80 00.

2.5 SEALANT MATERIALS

A. Sealant and Backing Material: As specified in Section 07 92 00.

2.6 FABRICATION

A. Fabricate windows allowing for minimum installation clearances and shim spacing around perimeter of assembly, yet enabling installation.

B. Rigidly fit joints and corners. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal corner joints with sealant.

C. Develop drainage holes with moisture pattern to exterior.

D. Prepare components to receive anchor devices. Fabricate anchorage items.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide internal reinforcement in mullions to maintain rigidity.

G. Factory glaze window units in accordance with manufacturer's instructions.

2.7 FINISHES

A. Factory applied Kynar 500 Fluorocarbon finish – color to be selected by Architect from manufacturers custom colors to match existing conditions.

B. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that wall openings are ready to receive Work of this Section.

B. Beginning installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install window frames, glass and glazing and hardware in accordance with manufacturer's instructions.

B. Use anchorage devices to securely attach frame to structure.

C. Align window frame plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent Work.

D. Pack fibrous insulation in shim spaces at perimeter to maintain continuity of thermal barrier.

E. Install sealant and backing materials as specified in Section 07 92 00.

F. Adjust operable hardware for smooth operation and tight fit of sash.

3.3 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces using a solution of mild detergent in warm water. Rinse with clean water, and wipe dry with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:

1. Door Hardware, including electric hardware.
2. Storefront and Entrance door hardware.
3. Gate Hardware.
4. Digital keypad access control devices.
5. Hold-open closers with smoke detectors.
6. Wall or floor-mounted electromagnetic hold-open devices.
7. Power supplies for electric hardware.
8. Low-energy door operators plus sensors and actuators.
9. Thresholds, gasketing and weather-stripping.
10. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.

1. Division 8: Section - Steel Doors and Frames.
2. Division 8: Section - Wood Doors.
3. Division 8: Section - Aluminum Storefront
4. Division 28: Section - Fire/Life-Safety Systems & Security Access Systems.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

A. 2016 California Building Code, CCR, Title 24.

B. BHMA – Builders' Hardware Manufacturers Association

C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

D. DHI – Door and Hardware Institute

E. NFPA - National Fire Protection Association.

1. NFPA 80 - Fire Doors and Other Opening Protectives
2. NFPA 105 - Smoke and Draft Control Door Assemblies

F. UL - Underwriters Laboratories.

1. UL 10C - Fire Tests of Door Assemblies
2. UL 305 - Panic Hardware

G. WHI - Warnock Hersey Incorporated

H. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit six (6) copies of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Include a Cover Sheet with;
   a. Job Name, location, telephone number.
   b. Architects name, location and telephone number.
   c. Contractors name, location, telephone number and job number.
   d. Suppliers name, location, telephone number and job number.
   e. Hardware consultant's name, location and telephone number.

2. Job Index information included;
   a. Numerical door number index including; door number, hardware heading number and page number.
   b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
   c. Manufacturers' names and abbreviations for all materials.
   d. Explanation of abbreviations, symbols, and codes used in the schedule.
   e. Mounting locations for hardware.
   f. Clarification statements or questions.
   g. Catalog cuts and manufacturer’s technical data and instructions.

3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)						
			(a) 1 Single Door #1 - Exterior from Corridor 101		(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM			
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS		(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS		626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.05 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Responsible for detailing, scheduling and ordering of finish hardware.
2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given

type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: "ND" Ten (10) years.
2. Electronic: One (1) year.
3. Closers: Thirty (30) years –except electronic closers shall be two (2) years.
4. Exit devices: Three (3) years.
5. All other hardware: Two (2) years.

1.08 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.

1. Hinges shall be sized in accordance with the following:
   a. Height:
      1) Doors up to 42" wide: 4-1/2" inches.
      2) Doors 43" to 48" wide: 5 inches.
   b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
   c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.

2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Floor Closers: Shall be equipped with compression springs, cam and roller operating mechanism and a one piece spindle-cam for maximum operating performance and longevity.

C. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.

D. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

E. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.

1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
   a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
   b. Offset lever pull – minimum 1,600 foot pounds without gaining access
   c. Vertical lever impact – minimum 100 impacts without gaining access

2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Provide wired electrified options as scheduled in the hardware sets.
    a. 12 through 24 volt DC operating capability, auto-detecting
    b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
    c. 0.230A (230mA) maximum current draw
    d. 0.010A (10mA) holding current
    e. Modular / "plug in" request to exit switch

12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

F. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of ¼" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.

G. Exit devices: Von Duprin as scheduled.

1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.

3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
12. Furnish glass bead kits for vision lites where required.
13. All Exit Devices to be sex-bolted to the doors.
14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.

H. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold

the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

I. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.

1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
2. Provide dust proof strikes at openings using bottom bolts.

J. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

K. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

L. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B-404.2.5.

M. Seals: Provide silicone gasket at all rated and exterior doors.

1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on “S” labeled Positive Pressure door assemblies.

N. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

O. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combinated by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.

B. Establish a new masterkey system for this project as directed by the keying schedule.

C. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI)

D. Furnish construction keying for doors requiring locking during construction.

1. For FSIC systems provide 23-030-ICX Full Size Construction Cores
2. For FSIC systems provide ten 48-101-ICX Construction Keys
3. For FSIC systems provide two 48-056-ICX Control Keys (const.)
4. For FSIC systems provide two control keys for installing the permanent cores (49-056 for “Classic” keyways, 48-052-XP for “Classic Primus”) (49-003 for “Everest Conventional”, 48-005–XP for “Everest Primus”)

E. Furnish all keys with visual key control.

1. Stamp key “Do Not Duplicate”.
2. Stamp unique owner identifier from the key bow.
3. Delete key section identifier from the key bow.
4. Delete key “bitting” from the key bow.

F. Furnish all cylinders with visual key control.

1. Stamp unique owner supplied code on cylinder side. (VKC) (6 character maximum).

G. Furnish mechanical keys as follows:

1. Furnish 2 cut change keys for each different change key code.
2. Furnish 1 uncut key blank for each change key code.
3. Furnish 6 cut masterkeys for each different masterkey set.
4. Furnish 3 uncut key blanks for each masterkey set.
5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
6. Furnish 1 cut control key cut to each SKD combination.

H. Furnish Key System Management Software (SM01-287 Windows on CD)

I. Furnish Keying Transcript (50-123) to owner. End-user to provide letter of authorization to hardware dealer to allow Schlage to mail transcript (bitting list) to the end-user or designated representative.

J. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.

1. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.

2. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
3. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

K. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.

1. Furnish CL100PB for use with non-I/C Schlage cylinders.
2. Furnish CL77R for use with FSIC Schlage cylinders.
3. Furnish CL721G for use with SFIC Schlage cylinders.

2.04 FINISHES

A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2013 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.

C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

ADA	=	Adams Rite Mfg.	Aluminum Door Hardware
GLY	=	Glynn-Johnson Corporation	Overhead Door Stops

IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers
JOH	=	L.E. Johnson	Sliding Door Hardware
LCN	=	LCN	Door Closers
SCE	=	Schlage Electronics	Electronic Door Components
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
TRI	=	Trimco	Signs
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

SPEXTRA: 363111
GROUP NO. 01

HARDWARE GROUPS

GROUP NO. 02

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL CLASSROOM SEC	ND95TD RHO XN12-035	626	SCH
2	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG13	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 03

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL CLASSROOM SEC	ND95TD RHO XN12-035	626	SCH
2	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG13	630	IVE
1	EA	SURFACE CLOSER	4111 EDA TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS434	604	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 04

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4011 TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER
1	EA	DOOR BOTTOM	360AA6	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 05

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL CLASSROOM SEC	ND95TD RHO XN12-035	626	SCH
2	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBSRT OR 4011 TBSRT AS REQ	MTLPC	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR BOTTOM	360AA6	AA	ZER

GROUP NO. 06

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL CLASSROOM SEC	ND95TD RHO XN12-035	626	SCH
2	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4011 TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER

GROUP NO. 07

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER

GROUP NO. 08

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER

GROUP NO. 09

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG13	630	IVE
1	EA	SURFACE CLOSER	4111 EDA TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS434	604	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER

GROUP NO. 10

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG13	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER

GROUP NO. 11

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	FAC RESTRM W/IND CYL	ND85PD RHO	626	SCH
1	EA	SURFACE CLOSER	4011 TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS11	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER

GROUP NO. 12

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS11	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER

GROUP NO. 13

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4011 TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS11	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER

GROUP NO. 14

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL CLASSROOM SEC	ND95TD RHO XN12-035	626	SCH
2	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4011 TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS11	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	GASKETING	312A	A	ZER
1	EA	DOOR BOTTOM	360AA6	AA	ZER

GROUP NO. 15

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	AX-99-L-2-06	626	VON
2	EA	RIM CYLINDER	20-057-ICX	626	SCH
2	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS434	604	IVE
1	EA	GASKETING	328AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	PER DETAIL		

GROUP NO. 16

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	LOCK GUARD	LG13	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 17

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	WS45	626	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 18

1	EA	SPRING PIVOT HINGE	4007MRB	630	MCK

GROUP NO. 19

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	OH STOP & HOLDER	100H	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

GROUP NO. 21

6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	CONST LATCHING BOLT	FB61P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
2	EA	OH STOP & HOLDER	100H	630	GLY
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	ASTRAGAL	43SP	SP	ZER

GROUP NO. 22

3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	CONVENTIONAL CORE	23-030	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER
1	EA	DOOR SWEEP	39A	A	ZER

END OF SECTION

Catalog Cuts

for

Martin Elementary School Modernization

Sorted by Manufacturer

Prepared By
ANTHONY WAN
ALLEGION
6689 OWEN DRIVE SUITE 200

PLEASANTON CALIFORNIA
Phone 925-463-7703 Fax 925-846-5952

Created 8/10/2018

Bid Set - Not For Construction 3/11/2019

Catalog Cut Summary

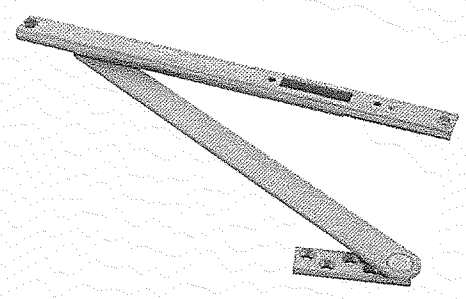
Mfr	Description	Catalog Number	Cut
GLY	OH STOP	100S	GLY_0004
GLY	OH STOP & HOLDER	100H	GLY_0004
IVE	HW HINGE	SBB1HW 4.5 X 4.5 NRP	IVE_0251
IVE	KICK PLATE	8400 10" X 2" LDW B-CS	IVE_0223
IVE	HW HINGE	5BB1HW 4.S X 4.5 NRP	IVE_02S1
IVE	FLOOR STOP	FS434	IVE_0131
IVE	WALL STOP	WS11	IVE_0143
IVE	CONST LATCHING BOLT	FB61P	IVE_0093
IVE	DUST PROOF STRIKE	DP1	IVE_0098
IVE	WALL STOP	WS406/407CVX	IVE_0141
IVE	WALL STOP/HOLDER	WS4S	IVE_0146
IVE	LOCK GUARD	LG13	IVE_0165
LCN	SURFACE CLOSER	4111 EDA TBSRT OR 4011 TBSRT AS REQ	LCN_4110
LCN	SURFACE CLOSER	4011 TBSRT	LCN_4010
LCN	SURFACE CLOSER	4111 EDA TBSRT	LCN_4110
MCK	SPRING PIVOT HINGE	4007MRB	MCK_087
SCH	RIM CYLINDER	20-057-ICX	SCH_0121
SCH	VANDL CLASSROOM SEC	ND95TD RHO XN12-035	SCH_0048
SCH	PRIVACY LOCK	ND40S RHO	SCH_0048
SCH	FSIC CORE	23-030	SCH_CYL_FSIC
SCH	VANDL OFFICE LOCK	ND91TD RHO	SCH_0048
SCH	ENTRANCE/OFFICE LOCK	NDS0TD RHO	SCH_0048
SCH	FAC RESTRM W/IND CYL	ND85PD RHO	SCH_0048
SCH	VANDL STOREROOM LOCK	ND96TD RHO	SCH_0048
VON	FIRE EXIT HARDWARE	AX-99-L-F-2-06-SNB	VON_0002~VON_0121~VON_0095
ZER	GASKETING	188S-BK	ZER_0114
ZER	DOOR BOTTOM	360AA6	ZER_0132
ZER	GASKETING	312A	ZER_0117
ZER	ASTRAGAL	43SP	ZER_0141

Bid Set - Not For Construction 3/11/2019

Mfr	Description	Catalog Number	Cut
ZER	GASKETING	328AA	ZER_0120
ZER	DOOR SWEEP	39A	ZER_0163

Bid Set - Not For Construction 3/11/2019

100 Series Concealed Overhead Door Holders/Stops



100 Series Heavy-Duty

Glynn-Johnson offers a complete line of overhead door holders and stops, accommodating virtually all openings with solutions for even the most complex door control problems. These concealed holders and stops provide the most attractive and reliable heavy-duty door control available.

Glynn-Johnsou 100 scries holders and stops provide the most reliable and versatile concealed overhead door control. They are designed for installation on virtually all types of doors mounted on conventional type butt hinges, pivots, continuous hinges, swing clear hinges and numerous other specialty hinges. When used in conjunction with many surface-applied door closers, 100 scries holders and stops provide the most effective control for entrance doors and vestibule doors of all types, as well as heavy or often used interior doors. Templates provided allow for variable mounting positions, ranging from 85° - 110° of openiug.

Five Models:
- 100H Series Hold-Open Model
- 100HP Series Internal Hold-Open Model
- 100F Scries Friction Hold-Open Model
- 100S Series Stop-Only Model
- 100SE Serics Special Stop-Only Model

Six Sizes:
- Each model comes in six sizes.
- Simple
- Standardized

Three Options:
- ADJ—Adjustable Jamb Bracket
- CJ—Jamb Bracket for use with LCN5030 Closer
- SOC—Pin-in-Sockct Security Screw Package

Unmatched Convenience:
- Non-handed
- Improved Compatibility with Door Closers
- Single/Double-Acting Doors
- Interior/Exterior Applications
- Reduced Door Prep
- Durable
- Improved Corrosion Resistance
- Function Conversion Kits are Available.

Materials and Finishes:
In Heavy Gauge Brass or 300 Serics Stainless Steel, these models offer the broadest range of finishes in the industry, complementing any design and offering the highest resistance to corrosion. Available in the following finishes:

Finishes	Description
US3	Polished Brass
US4	Satin Brass
US10	Satin Bronze
US10B	Oil Rubbed Bronze
US32	Polished Stainless Steel
US32D	Satin Stainless Steel
SP4	Powder Coat Brass
SP10	Powder Coat Bronze
SP28	Powder Coat Aluminum
SP313	Powder Coat Dark Bronze
SPBLK	Powder Coat Black

Models

These models provide a wide range of optional features, and are ideal for use on entrance and vestibule doors, large doors, doors opened frequently, or doors subject to abuse. These models are also furnished with an offset-style jamb bracket.

Designed for heavy-duty applications, 100 series models will provide long-lasting protection to doors, frames, hinges, related hardware and surrounding walls or obstructions.

100H Series Hold-Open

(Suffix H) The Hold-Open function should be used where it is desired to hold a door open at a predetermined position for short or long periods of time, permitting an unobstructed traffic flow through the opening.

These models are both selective and adjustable, featuring the most reliable Hold-Open mechanism available. They feature a control knob which protrudes from the face of the door and turns the Hold-Open function on or off. Set in the inactive position, the unit acts as a stop and shock absorber. The tension on the Hold-Open mechanism can be adjusted using an allen wrench to offset air currents or other exterior conditions. The Hold-Open tension adjustment is located in the bottom of the track in the top of the door.

100HP Series Internal Hold-Open

These models provide a Hold-Open unit with the Hold-Open mechanism built into the channel, thus reducing the door prep. The 100HP have a preset Hold-Open force that is not adjustable. The Hold-Open feature is not selectable in these units, so the doors are always held open.

Bid Set - Not For Construction 3/11/2019

100F Series Friction Hold-Open

(Suffix F) Friction Hold-Open models provide an alternative holding method, ideal for heavy patient room doors, closet doors or similar applications where multiple Hold-Open positions are desired. The friction tension is adjusted using an allen wrench and an open end wrench. The friction tension adjustment is located on the top of the slider in the channel.

100S Series Stop-Only

(Suffix S) When the Hold-Open function is not required, the Stop-Only function provides the same effective door control minus the Hold-Open feature. The Stop-Only model may be used on fire doors.

100SE Series Special Stop-Only

(Suffix SE) When Stop-Only models are used in conjunction with single point Hold-Open electronic door closers, they may be ordered without the shock-absorbing mechanism. Used as an auxiliary stop with these closers, they will prolong the life of the closer. The stop location is adjusted using an allen wrench on the stop block located in the channel.

Note: Caution should be used when using this option in other applications, as the elimination of the shock-absorbing spring can put added stress on door and frame if used improperly.

Application Information

UL Classification

The 100 series Stop-Only models are classified by Underwriters Laboratories (UL) as Miscellaneous Fire Door Accessories. This classification applies to use on either Hollow Metal Fire Doors or Wood Fire Doors. Where Wood Door manufacturer's listing allows for the cutout required for installation, concealed overhead stops may be used on those wood fire doors. These units may be used on doors of any rating. As a reminder, the Miscellaneous Fire Door Accessories (GVUX) section is defined by UL as: "Miscellaneous fire door accessories are intended in the individual Listings. The accessories have been investigated to determine that when installed in accordance with the manufacturer's instructions, the accessories do not adversely affect the fire rating of the fire door and/or fire door frames."

Dead Stop Templating:

If a wall or similar obstruction is in place at 110° or less opening angle (i.e. doors that open back-to-back), Dead Stop Templating should be used. This includes all Hold-Open, Friction and Stop-Only models, except when the "SE" Option is used. The Dead Stop position is reached when the shock-absorbing spring is fully compressed, the initial degree of opening will be 5° to 7° less than the Dead Stop opening.

Example: If the holder is templated to 100° Dead Stop, the door will hold open somewhere between 93° and 95°, but no further than 100°.

Note: Do not use dead-stop templating on the 100SE Series since there is no shock-absorbing spring.

Environmental Considerations:

Environmental factors should always be considered when specifying overhead holders and stops. Doors that are positioned on a building's exterior or subject to corrosive conditions should be equipped with a holder constructed primarily of stainless steel or brass materials. For interior applications, steel is acceptable, though brass substrates generally provide a more attractive architectural-grade finish.

Function Conversion Kits

- FK100F—Converts a 100H or 100S unit into a 100F unit. To order specify FK100F.
- FK100H—Converts a 100F or 100S unit into a 100H unit. To order specify FK100H.
- No kit is needed to convert a 100H or 100F unit into a 100S unit.

Options

Suffix ADJ (Adjustable Jamb Bracket):

An additional option on the 100 series is the adjustable jamb bracket, which allows the degree of Hold-Open or Stop angle to be adjusted after installation. Suffix "ADJ" is available in all functions, but only in sizes 3, 4, 5 & 6. ADJ jamb bracket requires additional frame prep. The ADJ option cannot be added to an existing unit, it must be factory ordered.

Suffix CJ (Closer Jamb Bracket):

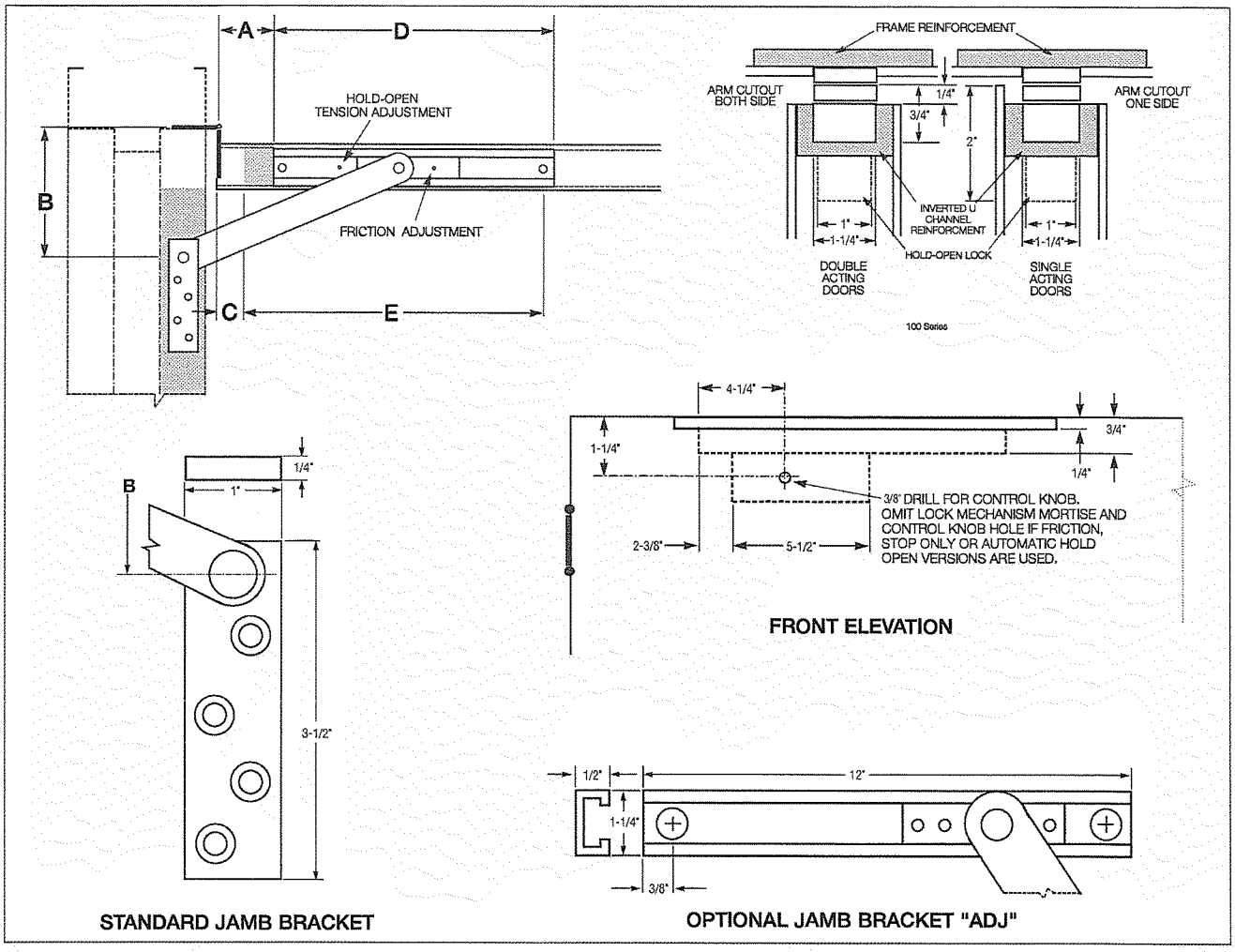
Provides a special jamb bracket needed for 100 series units used with LCN5030 closers. These special jamb brackets are handed, so handing will need to be specified when ordering the "CJ" option, CJLH for a left hand door and CJRH for a right hand door. The CJ option cannot be added to an existing unit, it must be factory ordered.

Suffix SOC (Pin-in-Socket Security Screw Package):

A screw package with pin-in-socket screws for mounting the jamb bracket to the frame is provided instead of the standard screw package.

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100 Series Concealed Overhead Door Holders/Stops



100 Series Sizing Chart

BUTTS/OFFSET PIVOTS					CENTER HUNG			
SIZE	DOOR OPENING	STOP ONLY	HOLD OPEN	FRICTION	DOOR OPENING	STOP ONLY	HOLD OPEN	FRICTION
1	18"–23"	101S*	101H*	101F*	-----	----	----	----
2	23-1/16"–27"	102S*	102H*	102F*	-----	-----	-----	-----
3	27-1/16"–33"	103S	103H	103F	33-1/16"–39"	103S	103H	103F
4	33-1/16"–39"	104S	104H	104F	39-1/16"–45"	104S	104H	104F
5	39-1/16"–45"	105S	105H	105F	45-1/16"–51"	105S	105H	105F
6	45-1/16"–54"	106S	106H	106F	51-1/16"–59"	106S	106H	106F

Note: This chart illustrates the most common types of hinging and door opening sizes. For unusual door details, contact Glynn-Johnson for availability.

**These sizes are not available for use with offset pivots. Also not available with the ADJ option.*

BHMA/ANSI, A156.8 & FED. Spec. Cross Reference		
G-J Model	BHMA*	FED. Spec.
101-106 H	C01511	1160
101-106 S	C01541	----
101-106 F	C01531	----

** First numeral (0) designates optional material.*

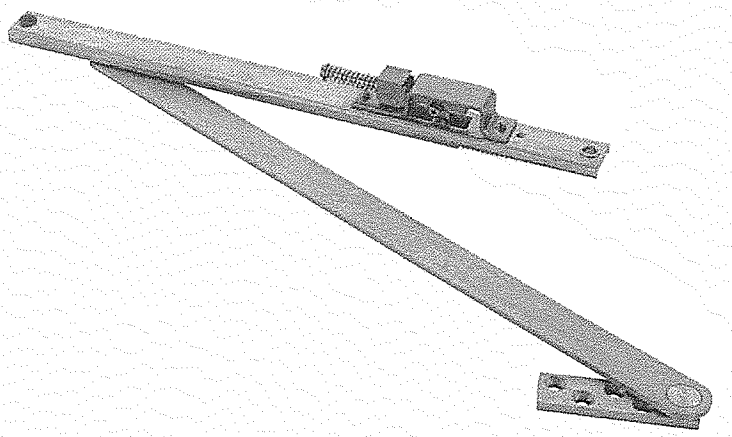
To specify:
Brass material, change 0 to 1 (i.e. C11511)
Stainless Steel material, change 0 to 5 (i.e. C51511)

BHMA

All 100 series models are designed for heavy-duty applications and far exceed BHMA cycle test and force test requirements for Grade 1 holders and stops.

The template information on this page is for reference only and is not intended to serve as an installation template. For complete dimensional information, refer to Glynn-Johnson template book.

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How to Order

10 4 H - US26D - ADJ

Overhead Series:
- **10**

Size (Door Opening Using Butts or Offset Pivots:
- **1** (18"–23")
- **2** (23-1/16"–27")
- **3** (27-1/16" –33")
- **4** (33-1/16"–39")
- **5** (39-1/16"–45")
- **6** (45-1/16"–54")

Function:
- **H** Hold-Open
- **HP** Internal Hold-Open
- **F** Friction Hold-Open
- **S** Stop-Only
- **SE** Special Stop-Only

Finishes:
- **US3** Polished Brass
- **US4** Satin Brass
- **US10** Satin Bronze
- **US10B** Oil Rubbed Bronze
- **US32** Polished Stainless Steel
- **US32D** Satin Stainless Steel
- **SP4** Powder Coat Brass
- **SP10** Powder Coat Bronze
- **SP28** Powder Coat Aluminum
- **SP313** Powder Coat Dark Bronze
- **SPBLK** Powder Coat Black

Options:
- **ADJ** Adjustable Jamb Bracket
- **CJLH** Special Jamb Bracket for LCN 5030 Closer, LH Door
- **CJRH** Special Jamb Bracket for LCN 5030 Closer, RH Door
- **SOC** Pin-in-Socket Security Screws

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Meets ANSI A156.3 Type 27.
UL Listed 90 Minute Fire Doors 8'0" x 8'0"

FB61P Top and Bottom Bolts (Pair)

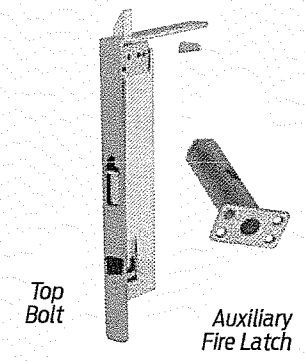
- Constant Latching—inactive door remains latched until the active door is opened, releasing the automatic bottom bolt and then the top bolt can be manually released. Inactive door will relatch automatically when door closes.
- Low Actuation Forces.
- Non-handed.
- Bolt throw is 3/4" with a 7/8" vertical adjustment.
- Bolt backset is 3/4"

DP1 or DP2 optional dust proof strike available, see page C11.

FB61T Top Bolt Only

FB62 Top Bolt with Auxiliary Fire Latch

- FB62 Model with Auxiliary Fire Latch eliminates the bottom bolt and is UL Listed for Fire Doors..



Meets ANSI A156.3 Type 27.
UL Listed 20 Minute Fire Doors 8'0" x 8'0"

Dimensions

Body Size: 1" Wide x 8-1/2" Long x 2" Deep

Guide Size: 1" Wide x 6" Long x 1/8" Thick

Strike Size: 15/16" Wide x 2-1/4" Long x 1/16" Thick

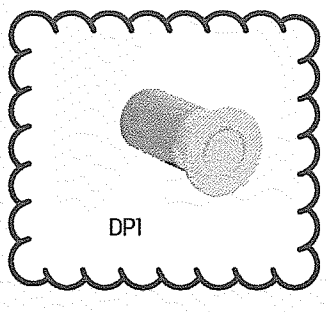
Rub Plate Size: 1-1/4" Wide x 1-11/16" Long x 3/64" Thick

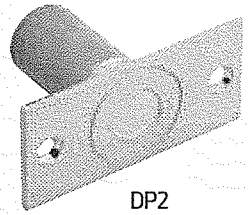
Auxiliary Fire Latch Size: 1" Wide x 1-3/4" Long x 3-1/4" Deep

Finishes

Ives Number	US3	US4	US10	US10B	US32	US32D
BHMA	605	606	612	613	629	630

Bid Set - Not For Construction 3/11/2019


DP1


DP2

DP1
DP2 Dust Proof Strikes

- Designed for use with the bottom bolt of all flush bolts.
- Spring-loaded plunger returns to floor or threshold level anytime flush bolt is retracted, eliminating need to clean standard floor strikes.
- Strike hole is 3/4" Diameter and 1-1/8" Deep

Dimensions

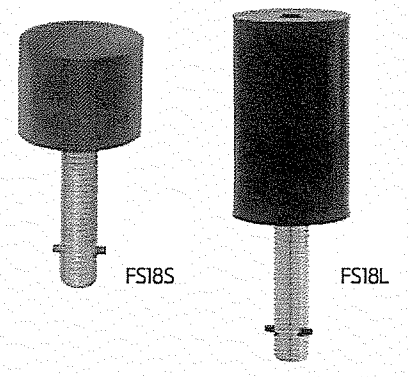
DP1 Face Plate: 1-7/16" Diameter
DP2 Face Plate: 1-5/8" W x 3-1/2" L x 1/8" Thick
Body: 1-3/16" Diameter x 1-7/8" Deep

Finishes

Ives Number	US3	US4	US10	US10B	US26	US26D
BHMA	605	606	612	613	625	626

Meets Meets ANSI/BHMA 156.16, L14011.

Bid Set - Not For Construction 3/11/2019



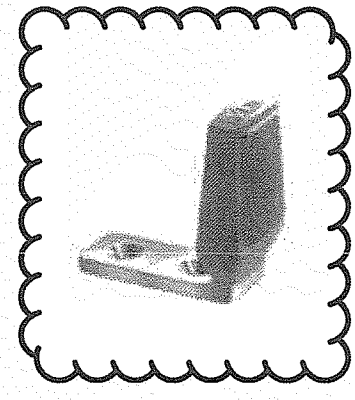
FS18S
FS18L Floor Stops

- Security Door Stops designed for use in high vandalism areas.
- Molded from black flame resistant, resilient material around a heavy-duty stud.
- Once grouted in concrete, leaves no exposed fasteners to be tampered with or removed.
- Ideal for jail or security cell areas where floor mounted stops are required.
- FS18L also ideal for concrete wall applications.

Dimensions

FS18S Height: 1-1/2"
FS18S Diameter: 2"
FS18S Stud Length: 2-1/2"

FS18L Height: 3-1/2"
FS18L Diameter: 2"
FS18L Stud Length: 2-1/2"



FS434 Floor Stop

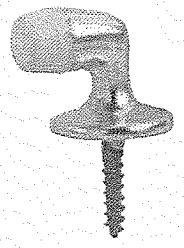
- Burnished wrought steel.
- For undercut doors up to 1-1/2".
- Packed with screws and plastic anchors.
- Replaceable soft, resilient gray rubber.

Dimensions

Overall Height: 2-5/8"
Base Size: 1-1/2" W x 2-3/4" L

Finishes

Ives Number	USC
BHMA	604



430 Floor Door Stop

- Burnished wrought steel.
- For undercut doors up to 1-1/2".
- Packed with screws and plastic anchors.
- Replaceable soft, resilient gray rubber.

Dimensions

Overall Height: 1-5/16"
Base Diameter: 1-1/4"

Finishes *brass*

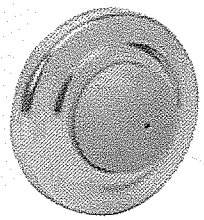
Ives Number	B3	B4	B5	B10B	B15	B26	B26D
BHMA	605	606	609	613	619	625	626

Finishes *aluminum*

Ives Number	A3*	A5	A14	A92
BHMA	666		669	673

** only available in Slim-Pak of 25*

Bid Set - Not For Construction 3/11/2019



WS406CVX & WS407CVX
Meets ANSI/BHMA 156.16 L22201 for brass, and L52101 for stainless steel.

WS406CCV & WS407CCV
Meets ANSI/BHMA 156.16 L22251 for brass and and L52251 for stainless steel.

WS406CVX Wall Bumpers
WS406CCV
WS407CVX
WS407CCV

- Constructed in sturdy yet economical wrought base of brass or stainless steel construction.
- Feature concealed tamper-proof mounting.
- Shipped factory preassembled backplate to reduce installation cost.
- Easy installation by inserting screwdriver through small hole in rubber.

WS406CVX (406) – convex rubber bumper, packed with wood screw and plastic anchor.
WS406CCV (406-1/2) – concave rubber bumper, which avoids damage to locks with projecting buttons, packed with wood screw and plastic anchor.
WS407CVX (407) – convex rubber bumper packed with screw and drywall anchor.
WS407CCV (407-1/2) – concave rubber bumper which avoids damage to locks with projecting buttons and is packed with screw and drywall anchor.

Dimensions

Base Diameter: 2-1/2"
Base Thickness: 3/8"
Overall Projection: 1"

Finishes *brass*

Ives Number	US3	US4	US5*	US10	US10B	US15	US15A**	US26	US26D	B716**
BHMA	605	606	609*	612	613	619	620	625	626	

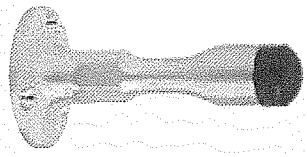
Finishes *stainless steel*

Ives Number	US32D
BHMA	630

** only available on WS407CVX Slim-Pak of 15*

*** available on WS407CCV or WS407CVX Slim-Pak of 15*

Bid Set - Not For Construction 3/11/2019



WS11
Meets ANSI/BHMA 156.16, L12011

WS11X
Meets ANSI/BHMA 156.16, L12021

WS11
WS11X Wall Stops

- Constructed in heavy duty cast brass.
- Hexagon section on unit aids in fastening unit when expansion shield is used.
- Replaceable rubber bumpers features off-set shoulder and threaded shank that screws into body of unit.

WS11 is furnished with wood screws for drywall mounting.
WS11X is furnished with a threaded stud and expansion shield for masonry type mounting.

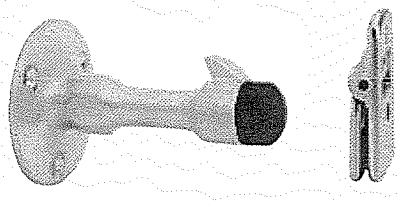
Dimensions

Base Diameter: 2"

Overall Projection: 3-3/4"

Finishes *brass*

Ives Number	US3	US4	US10	US10B	US26	US26D
BHMA	605	606	612	613	625	626



WS20
Meets ANSI/BHMA 156.16, L11341for brass and L32341 for aluminum

WS20X
Meets ANSI/BHMA 156.16, L11351 for brass and L31351 for aluminum

WS20
WS20X Manual Wall Holders

- Constructed in cast brass or aluminum.
- Replaceable rubber bumpers feature off-set shoulder and threaded shank that screws into body of holder.
- Hinged strike furnished matches body material and finish.

WS20 is furnished wood screws for drywall mounting.
WS20X is furnished with threaded stud and expansion shield for masonry type mounting.

Dimensions

Base Diameter: 2-3/8"

Overall Projection: 4"

Strike Height: 2"

Strike Width: 1"

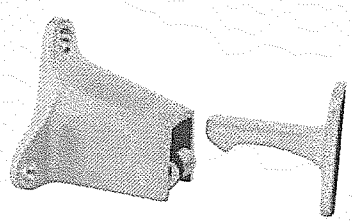
Finishes *brass*

Ives Number	US3	US4	US10	US10B	US26	US26D
BHMA	605	606	612	613	625	626

Finishes *aluminum*

Ives Number	US28
BHMA	628

Bid Set - Not For Construction 3/11/2019



Meets ANSI/BHMA 156.16, L11291 for brass and L31291 for aluminum.

WS40 Automatic Wall Holder

- Constructed of sturdy cast brass, or aluminum.
- Holder is mounted on wall and strike is mounted on door.
- Roller on holder rides up seats itself on strike, with a heavy duty bumper pad deadening the sound and shock.
- Universal screw pack accommodates all types wall construction.

Dimensions

Base Height: 2"
Base Width: 2-1/2"
Base Projection: 2-1/4"
Engaged Projection: 3-1/2"

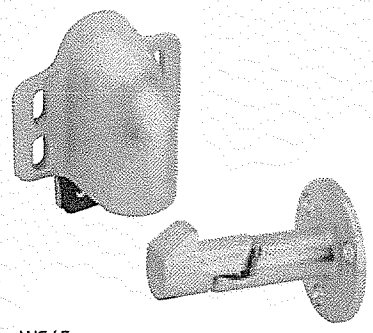
Strike Height: 2-1/16"
Strike Width: 3/4"
Strike Projection: 2"

Finishes *brass*

Ives Number	US3	US4	US10	US10B	US26	US26D
BHMA	605	606	612	613	625	626

Finishes *aluminum*

Ives Number	US28
BHMA	628



WS45
Meets ANSI/BHMA 156.16, L11291 for brass and L31291 for aluminum.

WS45
WS45X Automatic Wall Holder

- Constructed of cast brass, bronze or aluminum.
- Spring loaded roller rides up the face of the strike, seating itself on the strike, holding the door firmly in the open position.
- A heavy rubber pad cushions the shock and absorbs the sound.
- With unit mounted on door and the strike on wall, vertical adjustment is available on body.
- The strike is adjustable 45 degrees left or right, both adjustments easily accomplished at time of installation or at a later date.

WS45 strike is furnished with wood screws for drywall mounting.

WS45X strike is furnished with a threaded stud and expansion shield for masonry type mounting.

Dimensions

Base Height: 3-11/16"
Base Width: 3"
Base Projection: 2"
Engaged Projection: 3-7/16"

Strike Diameter: 2-3/8
Strike Projection: 3"

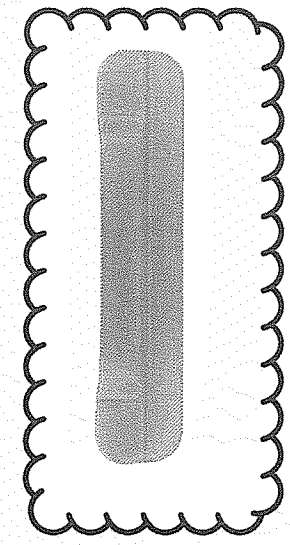
Finishes *brass*

Ives Number	US3	US4	US10	US10B	US26	US26D
BHMA	605	606	612	613	625	626

Finishes *aluminum*

Ives Number	US28
BHMA	628

Bid Set - Not For Construction 3/11/2019



LG13 Lock Guard

- Designed for use on all Type 161 Cylindrical Locks (ANSI 156.2 Series 2000) Monolock and Unilock.
- No exposed fasteners on face of unit.
- Unique design provides maximum security, virtually eliminating the opening between door and frame at latch point.
- Available in 13 Gauge Stainless Steel or 12 Gauge Steel.

Dimensions

1-1/2" Wide x 7" High

Stud center to center: 4-1/2"

Finishes

Ives Number	USP	US32D
BHMA	600	630



LG14 Lock Guard

- Narrow design unit for use on rose or escutcheon 3-1/2" or less.
- For use with Von Duprin 6210 and 6211 electric strike.
- No exposed fasteners on face of unit.
- Unique design provides maximum security.
- Available in 13 Gauge Stainless Steel

Dimensions

2-9/16" Wide x 9-1/2" High

Stud center to center: 8-1/2"

Finishes

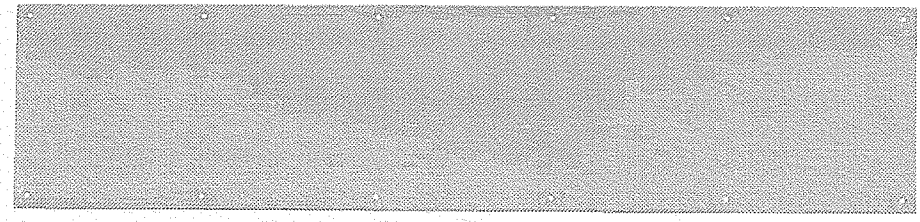
Ives Number	US32D
BHMA	630

Bid Set - Not For Construction 3/11/2019

8400 Series Protection Plates

- Door protection plates are available in .050" thick brass, stainless steel or aluminum; and 1/8" thick high impact polyethylene in clear or black.
- Bevel edge options; specify B4E for all four edges.
- Mounting screw pack furnished standard, 16 screws per pack. Optional screw packs are available for TEK or TORK screw heads. Refer to the following chart for ordering.
- Specify NMH for no mounting holes. (Not available on 8402)
- Specify NMH-A for no mounting holes with adhesive. (Not available on 8402)
- Specify CS for counter sunk mounting holes.
- Specify ERS prepped with extra row of screws.

Kickplate Gasket Tape Tape is recommended when using a brass plate on a metal door to reduce tarnishing from electrolytic oxidation. One tape pack will cover an the perimeters of a 8" x 34" kickplate. Order 8401 Gasket Tape.



8400 Protection Plate
8402 (UL)* Protection Plate

**UL mark appears in upper right corner. Factory supplied screws must be used.*

Number of screw packs required by plate size (specify TEK Screws or TORK screws).

	22"-25"	26"-33"	34"-41"	42"-48"
4"-8"	1	1	1	1
9"-16"	1	1	1	1
17"-24"	1	1	1	2
25"-32"	1	1	2	2
33"-40"	1	2	2	2
41"-48"	2	2	2	2

Finishes *brass 24" x 48" max. size*

US Number	US3	US4	US10	US10B	US15	US26	US26D
BHMA	605	606	612	613	619	625	626

Finishes *stainless steel*

US Number	US32	US32D
BHMA	629	630

Finishes *aluminum*

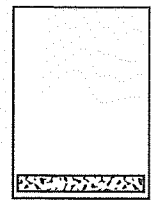
US Number	US28
BHMA	628

Finishes *plastic*

Clear and Black

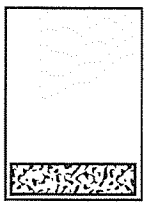
Residential Grade Kickplates available Carded only, finishes PA28, PA3, PA619, PA716, B3, B505, B619, B716

Bid Set - Not For Construction 3/11/2019



Mop Plates

- Protect the bottom of the pull side of door subject to cleaning and mopping procedures.
- Size Ranges:4" to 6" high, 22" to 48" wide



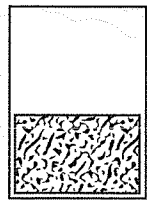
Kick Plates

- Protect the bottom of the push side of doors subject to scuffing from foot traffic.
- Recommended for all doors subject to normal use (especially doors using a closer).
- Size Ranges: 8" to 24" high, 22" to 48" wide



Stretcher Plates

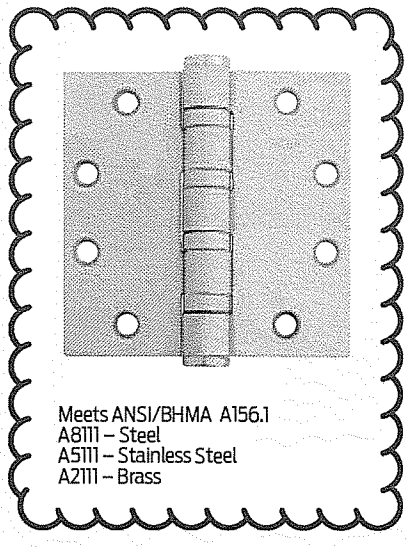
- Protect doors at specific areas where consistent contact is made by stretchers, service carts or other equipment.
- Usually applied to push side of doors.
- Specify "B4E" Option for beveled edges.
- Size Ranges: 6" to 8" high, 22" to 48" wide



Armor Plates

- Protect lower half of doors from abuse by hard carts, trucks and rough usage.
- Usually applied to push side of single doors and both sides of double acting doors.
- Size Ranges: 26" to 48" high, 22" to 48" wide

Bid Set - Not For Construction 3/11/2019



Meets ANSI/BHMA A156.1
A8111 – Steel
A5111 – Stainless Steel
A2111 – Brass

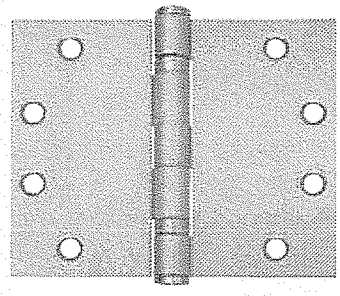
5BB1HW 5 Knuckle, Ball Bearing, Heavy Weight Full Mortise Hinge

- For heavy weight doors
- High frequency usage
- 4 ball bearing
- Packed with wood and metal screws

Options
- NRP, Non-Removable Pin
- SH, Security Stud
- HT, Hospital Tip
- RC, Round Corners - 1/4" or 5/8" Radius
- SEC, Security Fastners - Pin-in-Socket

Dimensions

Size (Inches)	Size (mm)	Gauge	Size (Inches)	Size (mm)	Gauge
4.5 x 4	114 x 102	0.180	5 x 4.5	127 x 114	0.190
4.5 x 4.5	114 x 114	0.180	5 x 5	127 x 127	0.190



Meets ANSI/BHMA A156.1
A8111 – Steel

5BB1WT 5 Knuckle, Ball Bearing, Wide Throw Full Mortise Hinge

- For medium weight doors
- Medium frequency usage
- 2 ball bearing
- Packed with wood and metal screws

Options
- NRP, Non-Removable Pin
- SH, Security Stud
- HT, Hospital Tip
- RC, Round Corners - 1/4" or 5/8" Radius
- SEC, Security Fastners - Pin-in-Socket

Dimensions

Size (Inches)	Size (mm)	Gauge
4.5 x 5	114 x 127	0.134
4.5 x 6	114 x 152	0.134
5 x 6	127 x 152	0.146
5 x 7	127 x 178	0.146
5 x 8	127 x 203	0.146

Finishes *brass*

Ives Finish	US3	US4	US10	US10B	US10A	US11	US15	US26	US26D
BHMA	605	606	612	613	614	616	619	625	626

Finishes *steel*

Ives Finish	USP	US3	US4	US10	US10B	US10A	US11	US15	US26	US26D
BHMA	600	632	633	639	640	641	643	646	651	652

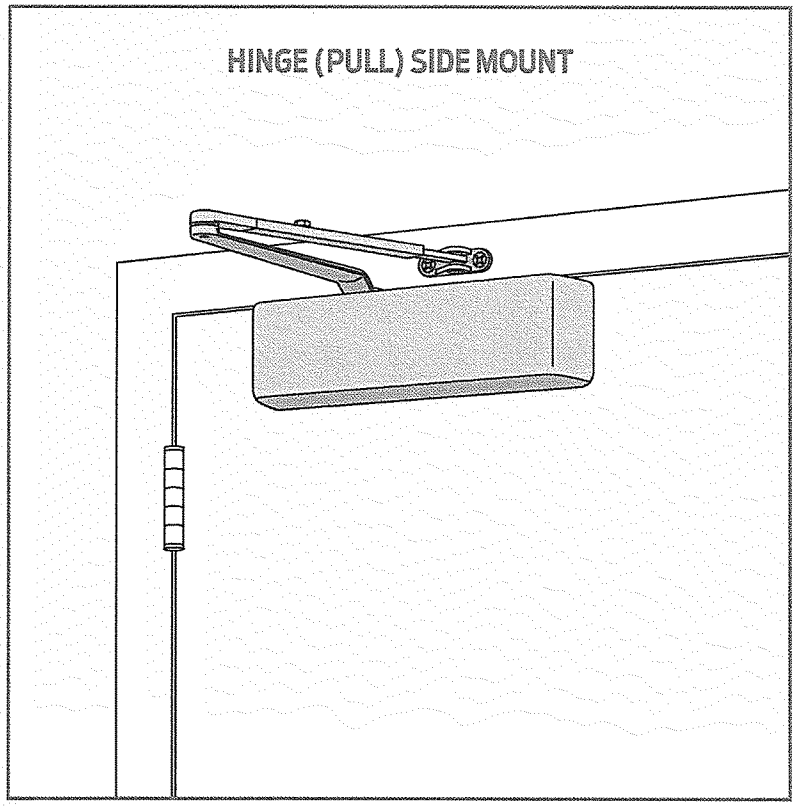
Finishes *stainless steel*

Ives Finish	US32	US32D
BHMA	629	630

Bid Set - Not For Construction 3/11/2019

4010 SERIES

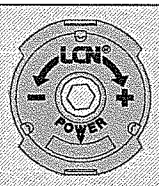
FEATURES



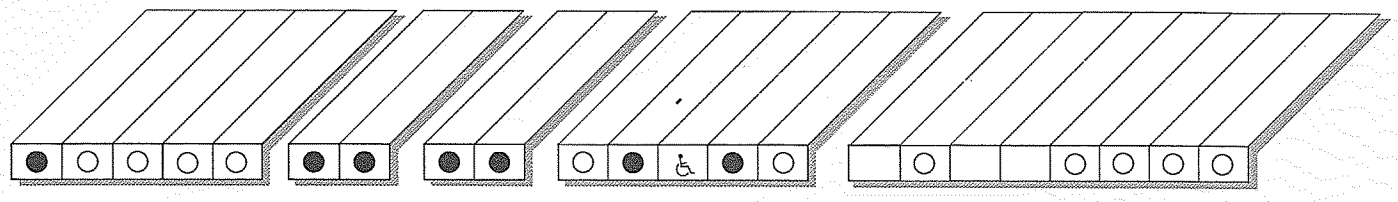
The 4010 is LCN's best performing heavy duty closer designed specifically for institutional and other rugged high traffic applications.

- Cast Iron
- Forged Steel Main Arm
- Double Heat Treated Steel Pinion
- All Weather Fluid
- LCN Patented Green Dial
- UL & cUL Listed
- Peel-n-Stick Templates for Fast and Accurate Installations

- Standard 4010 Series closer is shipped with regular arm, standard plastic cover, and self reaming and tapping screws. See 4010 Series page 5 for options.
- Size 6 (4016) cylinder for interior doors to 5´0˝ and exterior doors to 4´0˝.
- Non-sized cylinder (4011) adjustable for interior doors to 4´6˝ and exterior doors to 3´6˝.
- Closer mounts hinge side, specify right or left swinging door.
- 4011 cylinder meets ADA requirements. See 4010 Series page 6.
- Standard or optional custom powder coat finish.
- Optional plated finish on metal cover, arm and fasteners.
- Optional SRI primer for installations in corrosive conditions is available with powder coat finish only.
- The 4010 Series is UL and cUL listed with regular or fusible link arms for self-closing doors.
- Tested and certified under ANSI Standard A156.4, grade one.



The 4010 Series includes the **LCN® "Green Dial" Spring Force Indicator**



● AVAILABLE
○ NOT AVAILABLE

♿ *Closer available with less than 5.0 lbs. opening force on 36˝ door.*
*** Maximum opening/hold-open point with standard template.*
**** Advanced Variable Backcheck.*

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Bid Set - Not For Construction 3/11/2019

4010 SERIES

MOUNTING DETAILS

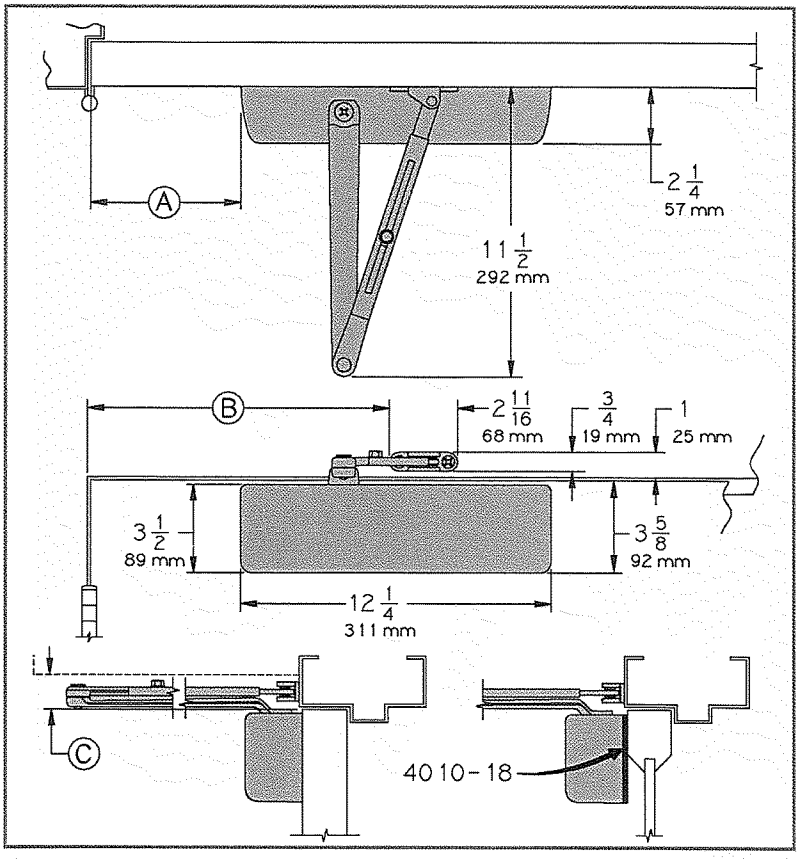
HINGE (PULL) SIDE MOUNTING

MAXIMUM OPENING

Can be templated for 100°,
Ⓐ = 5-15/16″ (151 mm)
Ⓑ = 11-15/16″ (303 mm)
or 140°.
Ⓐ = 4-3/16″ (106 mm)
Ⓑ = 10-3/16″ (259 mm)

Hold-open points up to maximum opening with hold-open arm.

Arm Clearance above door.
Regular arm requires
Ⓒ = 1-1/16″ (27 mm).
Hold-open arm requires
Ⓒ = 1-3/8″ (35 mm).
Fusible link arm requires
Ⓒ = 1-5/8″ (41 mm).



- **Butt Hinges** should not exceed 5″ (127 mm) in width.
- **Auxiliary Stop** is recommended at hold-open point or where a door cannot swing 140°.
- **Reveal** should not exceed 3/4″ (19 mm). Should not exceed 1/8″ (3 mm) for Fusible link arm.
- **Top Rail** less than 3-3/4″ (95 mm) requires PLATE, 4010-18. Plate requires 2″ (51 mm) minimum.
- **Clearance** of 2-1/4″ (57 mm) behind door required for 90° installation.
- **Delayed Action** Add suffix "DEL" to selected cylinder. Not available with 4016 cylinder. Delays closing from maximum opening to approximately 70°. Delay time adjustable up to approximately 1 minute.

Options
- Size 6 or non-sized cylinder.
- Delayed action cylinder.
- Hold-open or fusible link arm.
- Metal cover.

Special Templates
Customized installation templates or products may be available to solve unusual applications. Contact LCN Product Support for assistance.

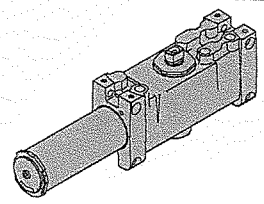
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Bid Set - Not For Construction 3/11/2019

CYLINDERS

CYLINDER, 4010-3071
Standard, handed cast iron cylinder assembly.
For various applications see "Table of Sizes" on 4010 Series page 6. Available in size 1 (Adjustable 1-5) or size 6.

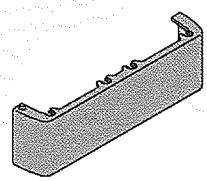
3071



COVERS

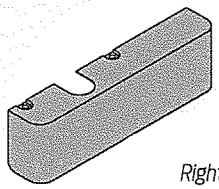
COVER, 4010-72
Standard, non-handed plastic cover.

72



METAL COVER, 4010-72MC
Optional, handed cover. Required for plated finishes and custom powder coat finishes.

72MC

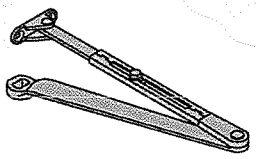


Right Hand Shown

ARMS

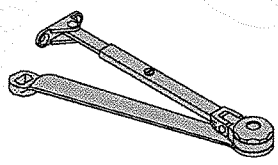
REGULAR ARM, 4010-3077
Non-handed arm.

3077



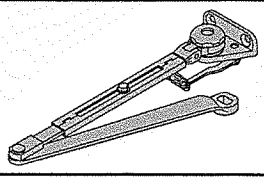
HOLD-OPEN ARM, 4010-3049
Optional, handed arm provides hold-open function, adjustable at elbow.

3049



FUSIBLE LINK ARM, 4010-3049FL
Optional, handed arm releases hold-open function when exposed to temperatures above 165° F. 1/8" (3 mm) maximum reveal.
NOTE: Check local codes before specifying FL arms. NOT A life safety product!

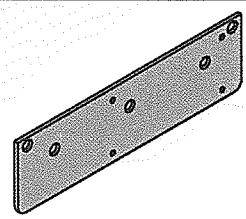
3049FL



INSTALLATION ACCESSORIES

PLATE, 4010-18
Required where top rail is less than 3-3/4" (95 mm).
Plate requires minimum 2" (51 mm) top rail.

18



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4010 SERIES

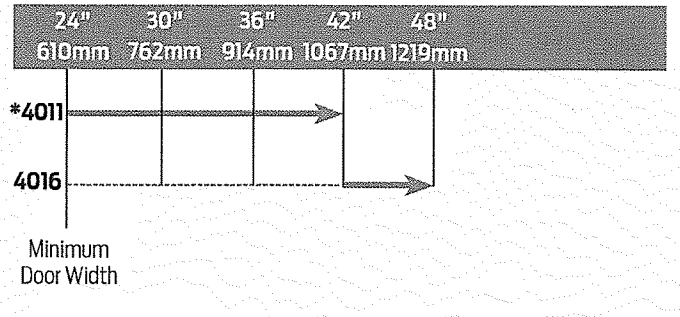
ORDERING INFORMATION

TABLE OF SIZES

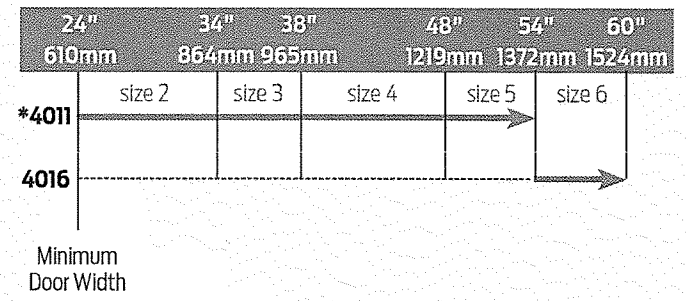
Select closer based on width of door.
The spring power of non-sized 4011 cylinder is adjustable from size 1 through size 5 and is shipped set to size 3.
Sized 4010 Series cylinders available in size 6.
Delayed action not available with 4016 cylinder.

→ Indicates recommended range of door width for closer size.

EXTERIOR (and VESTIBULE) DOOR WIDTH



INTERIOR DOOR WIDTH



** Adjustable Size 1 thru 5.*

REDUCED OPENING FORCE 4010 CLOSERS

CAUTION ! Any manual door closer, including those certified by BHMA to conform to ANSI Standard A156.4, that is selected, installed and adjusted based on ADA or other reduced opening force requirements may not provide sufficient power to reliably close and latch a door.

Refer to AUTOMATIC OPERATORS section for information on systems that meet reduced opening force requirements without affecting closing power.

	DOOR WIDTH	36"	42"	48"
♿	8.5* lbs.	4011	4011	4011
	5.0* lbs.	4011	4011	4011

** Maximum opening force.*

HOW-TO-ORDER 4010 SERIES CLOSERS

1. SELECT CYLINDER SIZE
- ☐ 4011 (adjustable from size 1 to 5)
- ☐ 4016 (DEL not available)

2. SPECIFY HAND
- ☐ RH
- ☐ LH

3. SELECT FINISH
- ☐ Standard Powder Coat _____
  Aluminum, Dark Bronze, Statuary, Light Bronze, Black, Brass.

Closer will be shipped with:
- STANDARD COVER,
- REGULAR ARM,
- SELF REAMING and TAPPING SCREWS,

unless options listed below are selected.

CLOSER OPTIONS

CYLINDER
- ☐ Delayed Action (DEL)

COVER
- ☐ Metal (MC)

ARM
- ☐ Hold-Open (H)
- ☐ Fusible Link, 165°F (FL)

FINISH
- ☐ Custom Powder Coat (RAL) _____
  (handed metal cover required)
- ☐ Plated Finish, US _____
  (handed metal cover required)
- ☐ SRI primer (use with powder coat finishes only)

SCREW PACK
- ☐ TB* & SRT Screw (TBSRT)
- ☐ Wood & Machine Screw (WMS)
- ☐ TB*, Wood & Machine Screw (TBWMS)
- ☐ TORX Machine Screw (TORX)
- ☐ TB* & TORX Machine Screw (TBTRX)

** Specify door thickness if other than 1-3/4".*

INSTALLATION ACCESSORIES
- ☐ Plate, 4010-18

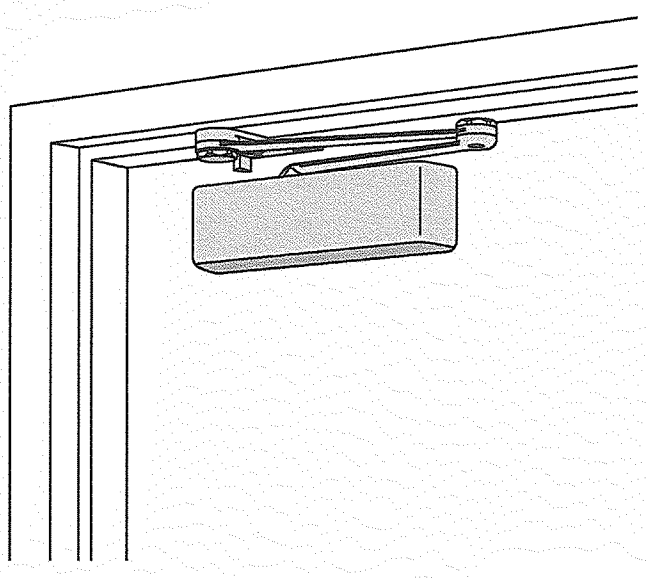
SPECIAL TEMPLATE
- ☐ ST-_____

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4110 SERIES

*PARALLEL ARM (PUSH SIDE) MOUNT



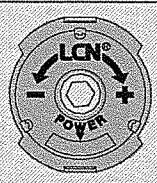
*4110 HCUSH mount shown

The 4110 is LCN's best performing heavy duty closer designed specifically for institutional and other rugged high traffic applications.

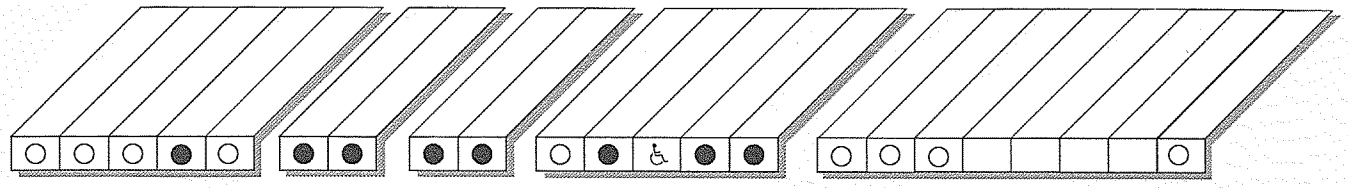
FEATURES

- Cast Iron
- Extra Duty Forged Steel Arm Standard
- Double Heat Treated Steel Pinion
- All Weather Fluid
- Advanced Variable Backcheck
- LCN Patented Green Dial
- UL & cUL Listed
- Peel-n-Stick Templates for Fast and Accurate Installations

- Standard 4110 Series closer is shipped with Extra Duty arm, standard plastic cover, 4110-201 FIFTH SCREW SPACER and self reaming and tapping screws. See 4110 Series pages 57 & 58 for options.
- Sized cylinders adjustable for interior doors to 5'0" and exterior doors to 4'0".
- Non-sized cylinder adjustable for interior doors to 4'6" and exterior doors to 3'6".
- Closer mounts parallel arm, specify right or left swinging door.
- 4111 cylinder meets ADA requirements. See 4110 Series page 59.
- Standard or optional custom powder coat finish.
- Optional plated finish on metal cover, arm and fasteners.
- Optional SRI primer for installations in corrosive conditions is available with powder coat only.
- The 4110 Series is UL and cUL listed for self-closing doors without hold-open.
- Tested and certified under ANSI Standard A156.4, grade one.



The 4110 Series includes the **LCN® "Green Dial" Spring Force Indicator**



● AVAILABLE
○ NOT AVAILABLE

♿ *Closer available with less than 5.0 lbs. opening force on 36" door.*
** *Maximum opening/hold-open point with standard template.*
*** *Advanced Variable Backcheck.*

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Bid Set - Not For Construction 3/11/2019

4110 SERIES

PARALLEL ARM (PUSH SIDE) MOUNTING

MAXIMUM OPENING

EDA or Fusible Link arm can be templated for
100°,
Ⓐ = 5-15/16″ (151 mm)
Ⓑ = 7-1/4″ (184 mm)
140°,
Ⓐ = 4-7/16" (113 mm)
Ⓑ = 5-3/4″ (146 mm)
or 180°.
Ⓐ = 2-15/16″ (75 mm)
Ⓑ = 4-1/4″ (108 mm)
Hold-open points up to maximum opening with HEDA or Fusible Link arm.

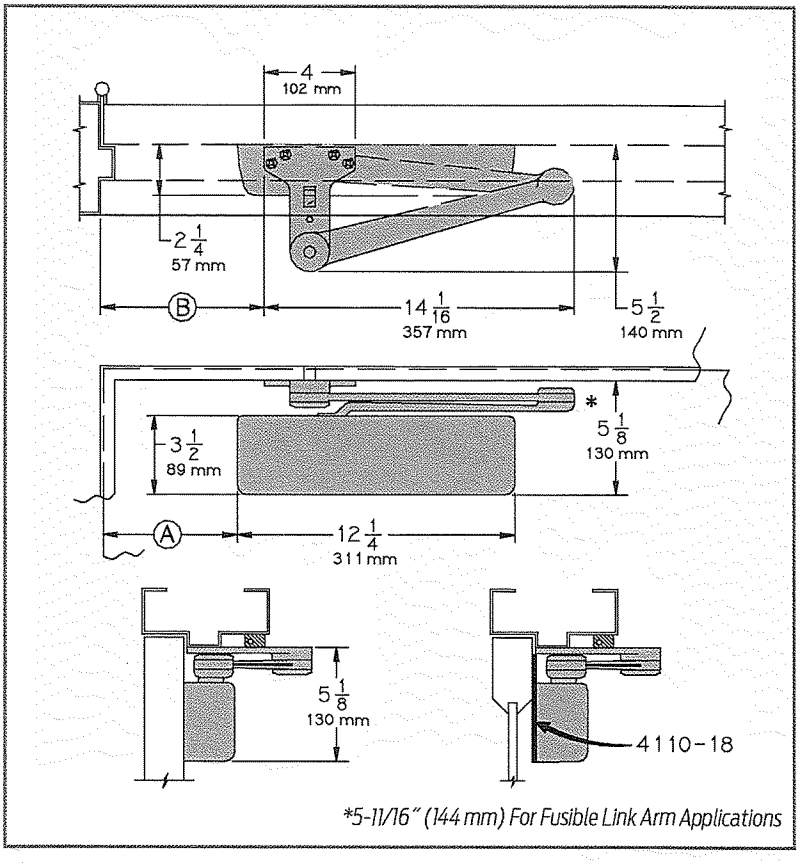
CUSH arm can be templated for maximum opening at
85°,
Ⓐ = 8-5/16″ (211 mm)
Ⓑ = 9-5/8″ (244 mm)
90°,
Ⓐ = 7-11/16″ (195 mm)
Ⓑ = 9″ (229 mm)
100°,
Ⓐ = 6-7/16″ (164 mm)
Ⓑ = 7-3/4″ (197 mm)
or 110°.
Ⓐ = 5-9/16″ (141 mm)
Ⓑ = 6-7/8″ (175 mm)
Hold-open point at maximum opening with HCUSH arm.
Spring Cush hold-open points are approximately 5° less than templated stop point.

Options

- Size 6 or non-sized cylinder.
- Delayed Action and/or Advanced Variable Backcheck cylinder.
- HEDA, CUSH, HCUSH, SPRING CUSH, SPRING HCUSH or Fusible Link arm.
- Metal cover.

Special Templates

Customized installation templates or products may be available to solve unusual applications. Contact LCN Product Support for assistance.



**5-11/16″ (144 mm) For Fusible Link Arm Applications*

- **Butt Hinges** should not exceed 5″ (127 mm) in width.
- **Auxiliary Stop** is recommended at hold-open point, where a door cannot swing 180°, or where CUSH-N-STOP arm is not used.
- **Clearance** for EDA, or CUSH shoe is 5-1/2″ (140 mm) from door face.
- **Top Rail** less than 5-1/8″ (130 mm) measured from stop requires PLATE, 4110-18. Plate requires 2″ (51 mm) minimum measured from the stop.
- **Stop Width** minimum 1″ (25 mm).
- **Head Frame** flush or rabetted requires CUSH FLUSH PANEL ADAPTER, 4110-419.
- **Reveal** less than 2-3/4″ (70 mm), use CUSH SHOE SUPPORT, 4110-30 with CUSH arms.
- **Blade Stop Spacer**, 4110-61 required to clear 1/2″ (13 mm) blade stop.
- **Cush Arm** requires CUSH SHOE SUPPORT, 4110-30 for fifth screw anchorage with CUSH arms.
- **Delayed Action** Add suffix "DEL" to selected cylinder (eg. 4111 DEL). Not available with 4116 cylinder. Delays closing from maximum opening to approximately 70°. Delay time adjustable up to approximately 1 minute.
- **Advanced Variable Backcheck** cylinder starts backcheck at approximately 45° instead of the normal 75°. Add suffix "AVB" to selected cylinder.

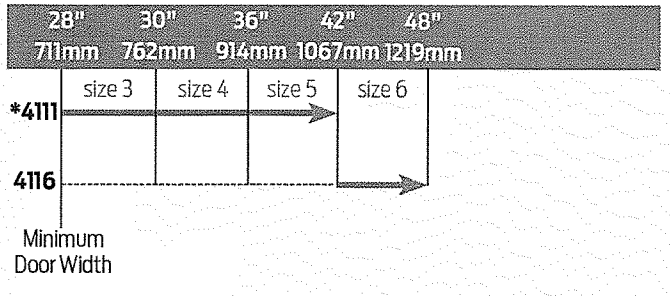
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TABLE OF SIZES

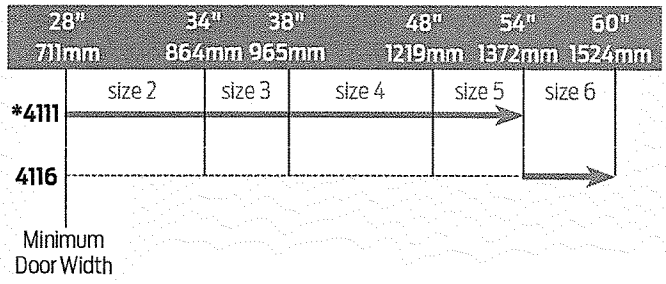
Select closer based on width of door.
The spring power of non-sized 4111 cylinder is adjustable from size 1 through size 5 and is shipped set to size 3.
Sized 4116 series cylinders 6.
Delayed action not available with 4116 cylinder
H - CUSH and SPRING H-CUSH arm not available with 4116 cylinder.

EXTERIOR (and VESTIBULE) DOOR WIDTH



** Adjustable Size 1 thru 5*

INTERIOR DOOR WIDTH



→ Indicates recommended range of door width for closer size.

** Adjustable Size 1 thru 5.*

REDUCED OPENING FORCE 4110 CLOSERS

CAUTION ! Any manual door closer, including those certified by BHMA to conform to ANSI Standard A156.4, that is selected, installed and adjusted based on ADA or other reduced opening force requirements may not provide sufficient power to reliably close and latch a door.

Refer to AUTOMATIC OPERATORS section for information on systems that meet reduced opening force requirements without effecting closing power.

	DOOR WIDTH	36"	42"	48"
♿	8.5* lbs.	4111	4111	4111
	5.0* lbs.	4111	4111	4111

** Maximum opening force.*

HOW-TO-ORDER 4110 SERIES CLOSERS

1. SELECT CYLINDER SIZE
- ☐ 4111 (adjustable from size 1 to 5)
- ☐ 4116 (DEL, SHCUSH or HCUSH arm not available)

2. SPECIFY HAND
- ☐ RH
- ☐ LH

3. SELECT FINISH
- ☐ Standard Powder Coat _____
  Aluminum, Dark Bronze, Statuary, Light Bronze, Black, Brass.

Closer will be shipped with:
- STANDARD COVER,
- FIFTH SCREW SPACER,
- EDA ARM,
- SELF-REAMING and TAPPING SCREWS

unless options listed below are selected.

4110 CLOSER OPTIONS

CYLINDER
- ☐ Delayed Action (DEL) (not available with 4116)
- ☐ Advanced Variable Backcheck (AVB)

COVER
- ☐ Metal (MC)

FINISH
- ☐ Custom Powder Coat (RAL) _____
  (handed metal cover required)
- ☐ Plated Finish, US _____
  (handed metal cover required)
- ☐ SRI primer (use with powder coat finishes only)

SPECIFY ARM
- ☐ Hold-Open Extra Duty (HEDA)
- ☐ Fusible Link, 165° F (FL)
- ☐ Cush-N-Stop (CUSH)
- ☐ H-Cush-N-Stop (n/a with 4116 cylinder) (HCUSH)
- ☐ Spring Cush (SCUSH)
- ☐ Spring H-Cush (n/a with 4116 cylinder) (SHCUSH)
- ☐ Extra Duty (EDA)
- ☐ H-Extra Duty (HEDA)

SCREW PACK
- ☐ TB*, Self-Reaming & Tapping (TBSRT)
- ☐ Wood & Machine Screw (WMS)
- ☐ TB*, Wood & Machine Screw (TBWMS)
- ☐ TORX Machine Screw (TORX)
- ☐ TB* & TORX Machine Screw (TBTRX
  ** Specify door thickness if other than 1-3/4".*

INSTALLATION ACCESSORIES
- ☐ Plate, 4110-18
- ☐ CUSH Shoe Support, 4110-30
- ☐ Blade Stop Spacer, 4110-61
- ☐ PA Flush Panel Adapter, 4110-419

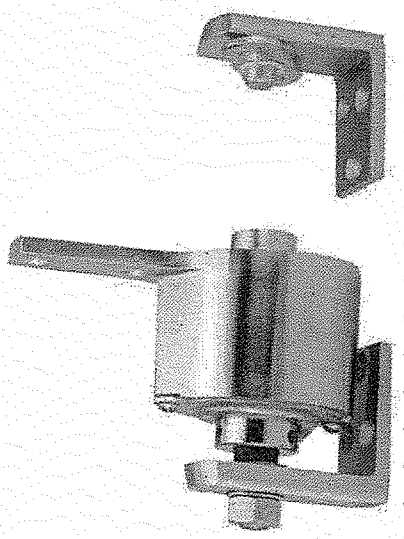
SPECIAL TEMPLATE
- ☐ ST-_____

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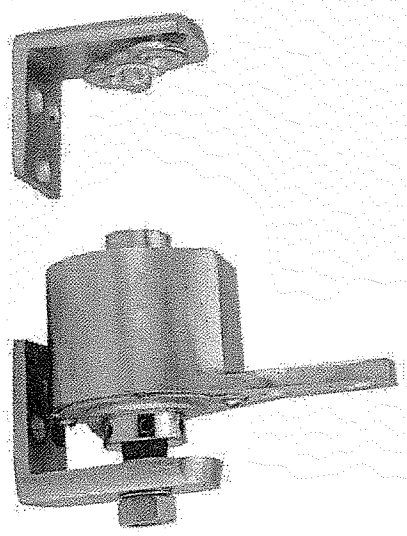
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McKINNEY Hinge Catalog
Sagless Double Acting
Gate Spring Pivot Hinge

4007RB-MALLEABLE IRON



4007MRB-MALLEABLE IRON



Features:

- For use on wood and metal gates
- All wood screws
- Exterior tension adjustment
- Anti-friction bearings
- Pintle adjustment with locking device

Furnished painted or in finely plated finish.

Has an exterior tension adjustment which can be adjusted after hinge is applied. Anti-friction bearing to carry the weight of the gate and an anti-friction bearing in the top socket which reduces friction and wear. The pintle has an adjustment in the bottom attachment with a locking device which permits aligning the gate or setting the gate in desired position. Spring is large enough for heavy duty conditions but the adjustable tension makes it equally suited for light gates.

The 4007 RB Series attachments are applied to the surface of the frame and the box is applied to the bottom surface of the gate. However, in the 4007MRB Series, the box is mortised into the bottom of the gate.

Specify MRB for mortised box and reversed brackets; specify RB for reverse brackets only.

Before ordering, please note clearances in chart.

Clearances

Catalog #	4007MRB	4007RB
Minimum Clearance Under Gate	2⅜"	4"
Gate or Handrail Thickness	1⅛ -2½"	1⅛ -2½"
Weight of Gate	75	75
Width of Gate	3'0"	3'0"
Width of Jamb Attachment	1½"	1½"

* Minimum height for weights shown. Hinge capacity decreases as door height decreases.

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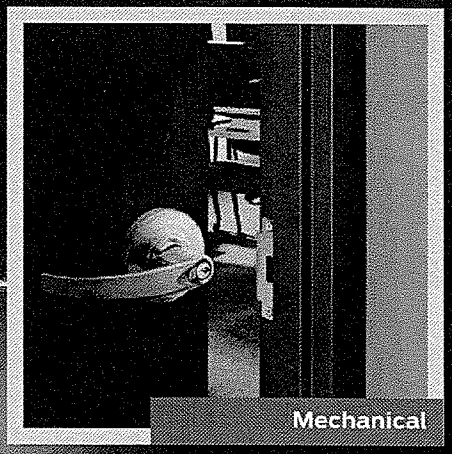
ALLEGION

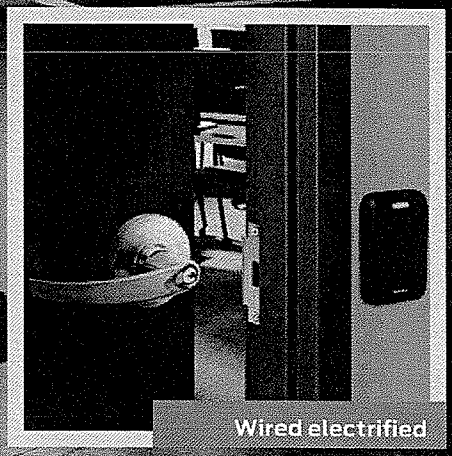
SCHLAGE

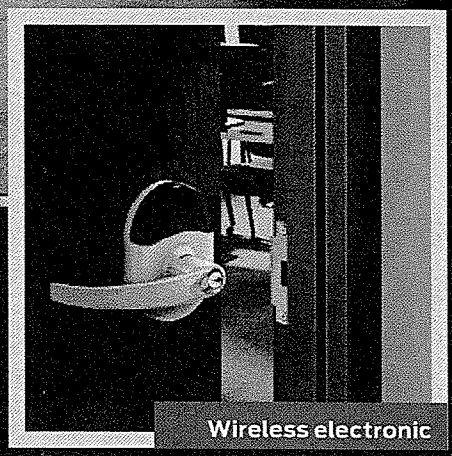
ND Series

Grade 1 cylindrical locks

Mechanical
Wired electrified
Wireless electronic



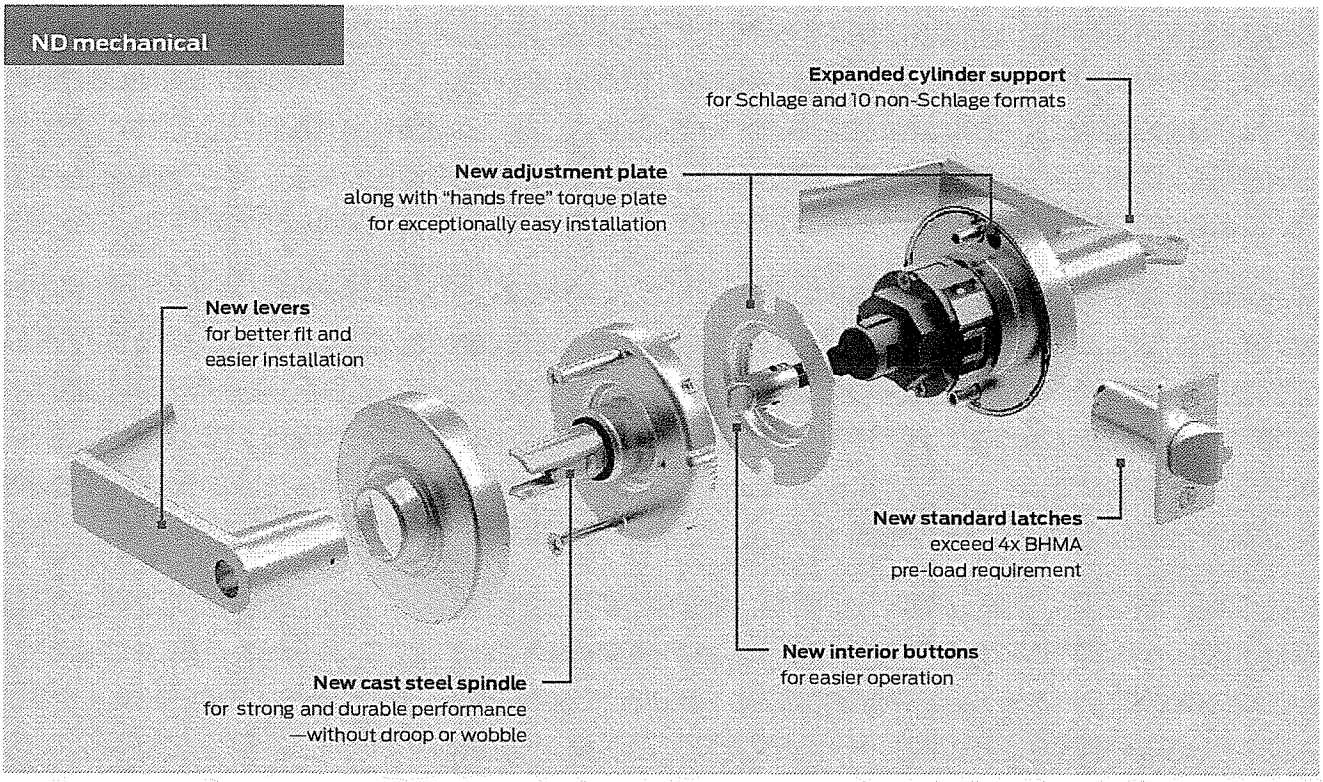




Bid Set - Not For Construction 3/11/2019

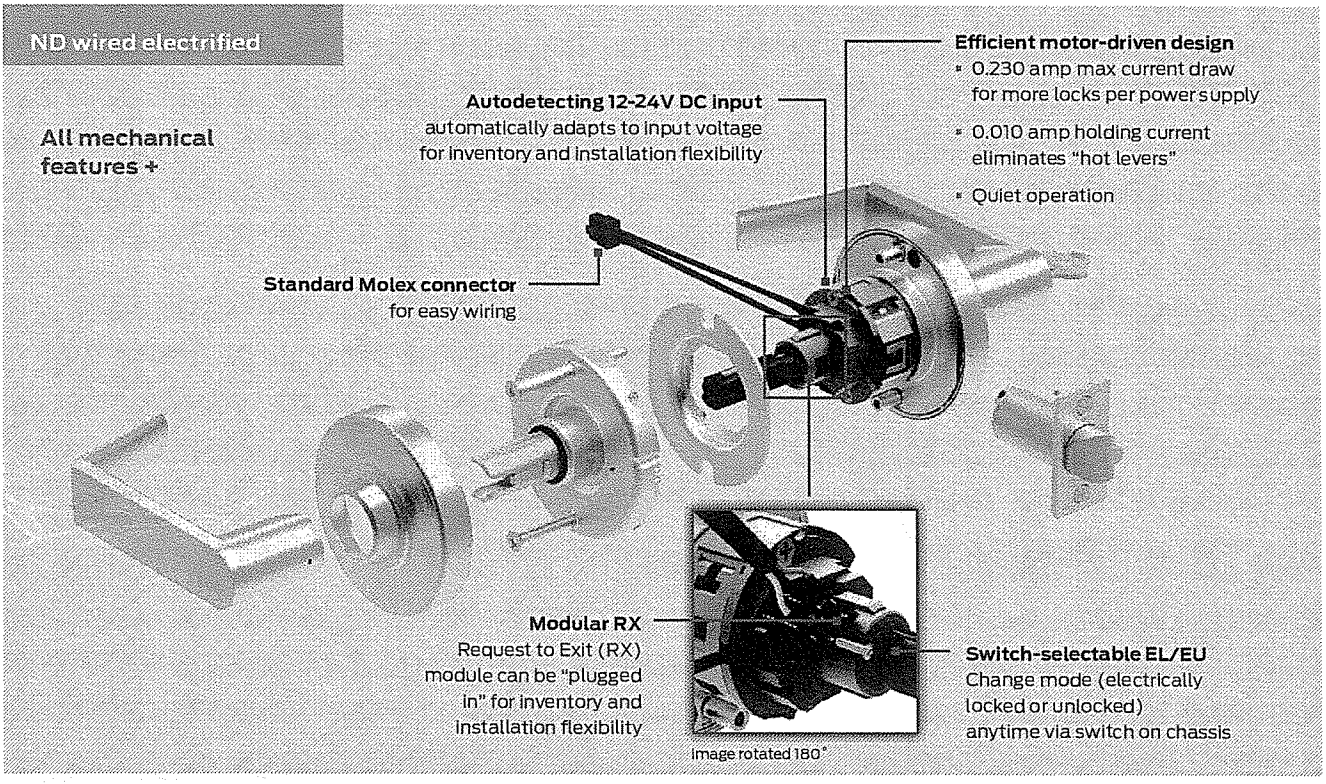
A detailed look...

ND mechanical



ND wired electrified

All mechanical features +



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NDE wireless electronic

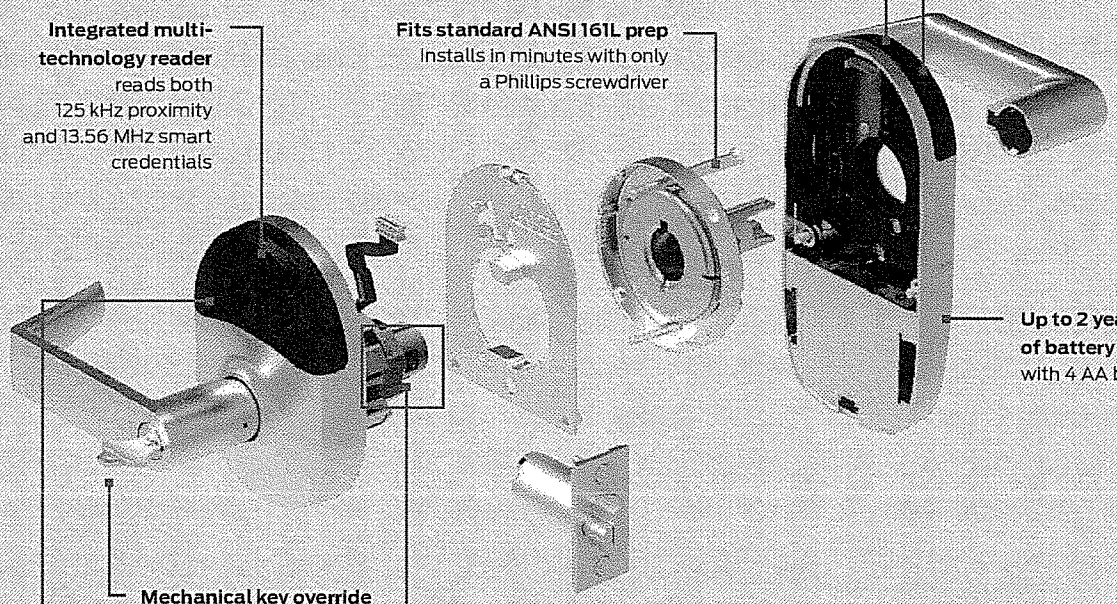
All mechanical features +

Built-in Bluetooth enables wireless configuration from smart phones and tablets

Built-in Wi-Fi enables automatic updates to access rights

Integrated multi-technology reader reads both 125 kHz proximity and 13.56 MHz smart credentials

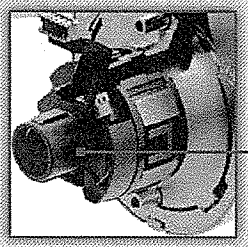
Fits standard ANSI 161L prep Installs in minutes with only a Phillips screwdriver



Up to 2 years of battery life with 4 AA batteries

Mechanical key override compatible with most popular key systems

Built-in No-Tour eliminates the need to visit the locks by using smart credentials to update access rights



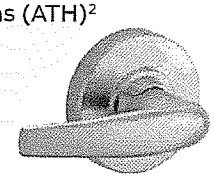
Integrated door position sensor requires no additional prep

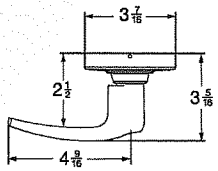
Image rotated 180°

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Lever designs and finishes

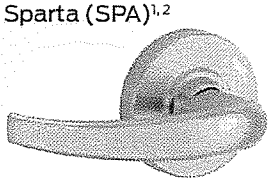
Athens (ATH)[2]

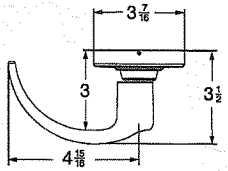




Mechanical | Wired electrified | Wireless electronic

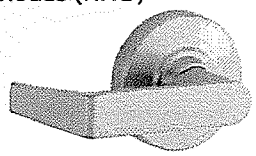
Sparta (SPA)[1,2]

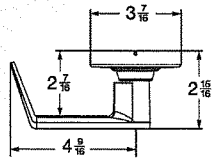




Mechanical | Wired electrified | Wireless electronic

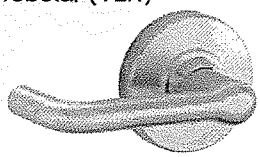
Rhodes (RHO)[1,2]

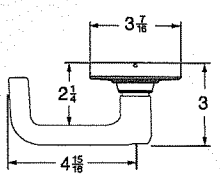




Mechanical | Wired electrified | NDE wireless electronic

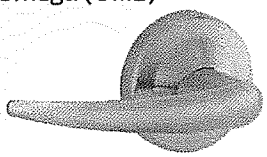
Tubular (TLR)[1,2]

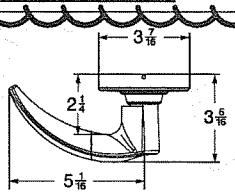




Mechanical | Wired electrified | Wireless electronic

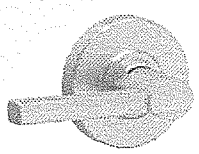
Omega (OME)[1]

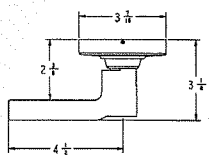




Mechanical | Wired electrified | Wireless electronic

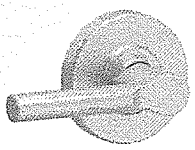
Latitude (LAT)

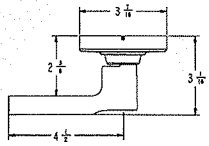




Mechanical | Wired electrified | Wireless electronic

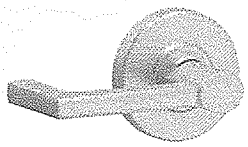
Broadway (BRW)

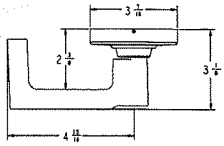




Mechanical | Wired electrified | Wireless electronic

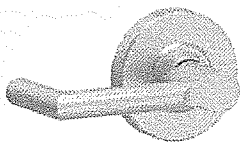
Longitude (LON)

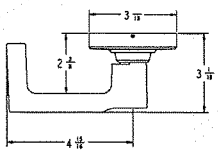




Mechanical | Wired electrified | Wireless electronic

Boardwalk (BWK)





Mechanical | Wired electrified | Wireless electronic

All levers comply with the Americans with Disabilities Act (ADA).

1 Boardwalk, Longitude, Omega, Rhodes, Sparta and Tubular levers comply with California State code for return within ½" of door face.

2 Athens, Rhodes, Sparta and Tubular levers support cylinders from other manufacturers, see cylinder section on page 24 for details.

Finish options



Color	Bright brass	Satin brass	Satin bronze	Oil rubbed bronze	Satin nickel	Matte black	Bright chrome	Satin chrome	Aged bronze
ANSI/BHMA number	605	606	612	613	619	622	625	626/626AM	643e
US number	US3	US4	US10	US10B	US15	US19	US26	US26D	US11
Mechanical	▩	▩	▩	▩	▩	▩	▩	▩	▩
Wired electrified	▩	▩	▩	▩	▩	▩	▩	▩	▩
Wireless electronic	▩	▩	▩	—	▩	▩	▩	▩	▩

Product information and specifications contained in this catalog are subject to change without notice. Please consult the factory.

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Accessibility and life safety

Door hardware should be as effective in helping people go about their lives as it is in securing their environments. The Schlage ND is designed with this requirement in mind.

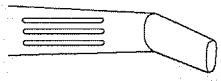
Accessibility

All Schlage ND levers comply with the Americans with Disabilities Act (ADA), which requires that "Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N) maximum."

Tactile warning for the visually impaired

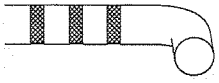
Tactile warning is a special texture applied to the outside lever to alert the visually impaired to a potential hazard on the opposite side of the door (exit to street, a workshop or other hazardous area, etc). Tactile warning is typically applied to the outside lever only, and is specified by an 8 prefix on the lever design.

Milled



Order as follows:
8AT for Athens
8RO for Rhodes
8SP for Sparta
8LT for Latitude
8LN for Longitude

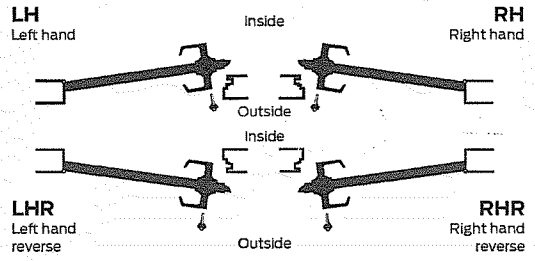
Knurled



Order as follows:
8TR for Tubular
8BW for Broadway
8BK for Boardwalk

Door handing

The ND lock family can be configured during installation to support any door handing. As a result, it is not necessary to specify handing during the ordering process.



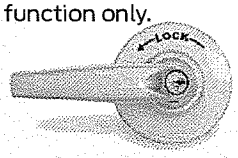
Life safety

The Schlage ND is UL listed for use on 3-hour fire doors up to 4'0" x 10'0". The Boardwalk, Longitude, Omega, Rhodes, Sparta and Tubular levers levers comply with the California State fire code for return to within ½" of the door face.

Additionally, the Schlage ND exceeds the BHMA warped door test by 4x. The BHMA standard requires that the latch be able to retract with a 50lb pre-load; the ND can retract the latch with a 200lb preload - providing more range to open the door in the event the opening becomes bound or otherwise compromised.

Classroom security indicator rose

Schlage ND classroom security functions come standard with an indicator rose that clearly identify key rotation direction for rapid lockdown. For ND mechanical classroom security function only.



Bid Set - Not For Construction 3/11/2019

ND Series mechanical lock

The ND mechanical lock, along with being Schlage's best selling mechanical lock, is the foundation for both the wired electrified and NDE wireless electronic lock. Not only did Schlage invent the cylindrical lock, but we continue to make it better with capabilities such as:

- Unparalleled strength - the lock prevents access even when subjected to torque loads up to 3,100 in-lbs (2.6x BHMA[1]), withstands pry bar attacks of 1,600 lbs (8x BHMA requirements[1]), and withstands 100 hammer blows (20x BHMA requirements[1,2])
- Exceptional durability - cycle tested to over 16M cycles (16x BHMA requirements[1]) with near zero droop or wobble - without the use of set screws or O-rings
- Improved feel - improved strength and durability are more than numbers, you can actually feel it in the lock
- Improved installation - installation is even easier than before (and withoutany set screws or O-rings)

All this is in addition to what you know and expect with the Schlage ND: 31 mechanical functions (plus wired electrified and wireless electronic) to meet the needs of any application; nine lever designs that suite with otherSchlage locks and Von Duprin exit devices; renowned sales, customer and technical support.

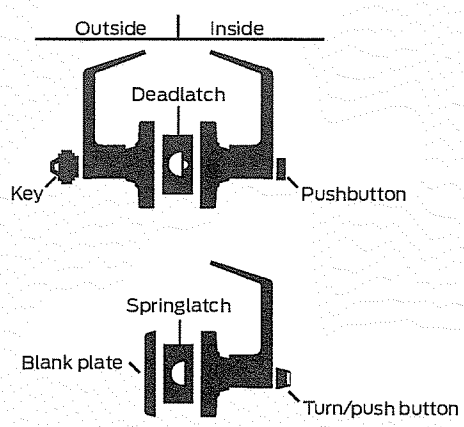


1 Beyond grade 1 performance for ND locks with Schlage cylinders only (standard, FSIC & SFIC). Performance with non-Schlage cylinders will exceed BHMA grade 1 requirements but may be less than the performance of products with Schlage cylinders.

2 Vertical impact testing stopped after 100 blows with no sign of failure or stress.

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Legend



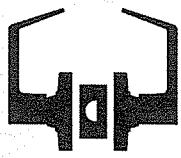
Schlage ANSI

ND10S F75

Passage latch

- Both levers always unlocked.

Inside



Available with RX

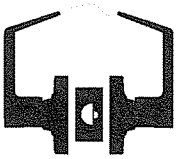
Schlage ANSI

ND12D F89

Exit lock

- Outside lever always fixed.
- Inside lever always free for immediate egress.

Outside Inside



Available with RX

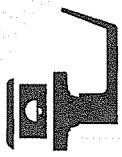
Schlage ANSI

ND25D -

Exit lock

- Blank plate outside.
- Inside lever always free for immediate egress.

Outside Inside



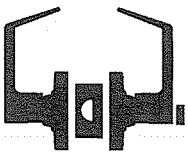
Schlage ANSI

ND40S F76

Bath/bedroom privacy lock

- Push-button locking.
- Unlocked from outside with a small screwdriver.
- Turn inside lever or close door to release button.
- Inside lever always free for immediate egress.

Outside Inside



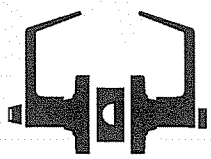
Schlage ANSI

ND44S -

Hospital privacy lock

- Push-button locking.
- Unlocked from outside by turning emergency turn-button.
- Turn inside lever or close door to release button.
- Inside lever always free for immediate egress.

Outside Inside



Schlage ANSI

ND170 -

Single dummy trim

- Dummy trim for one side of door.
- Used for door pull or as matching inactive trim.

Outside/Inside



Bid Set - Not For Construction 3/11/2019

ND Series mechanical lock
Keyed function list

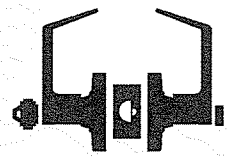
Schlage ANSI

ND50PD F82

Entrance/office lock

- Push-button locking.
- Push-button locks outside lever until it is unlocked with key or by turning inside lever.
- Inside lever always free for immediate egress.

Outside Inside



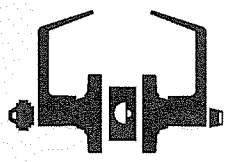
Schlage ANSI

ND53PD F109

Entrance lock

- Turn/push-button locking: Pushing and turning the button locks the outside lever, requiring use of a key until the button is manually unlocked.
- Push-button locking: Pushing button locks outside lever until unlocked by key or by turning the inside lever.
- Inside lever always free for immediate egress.

Outside Inside



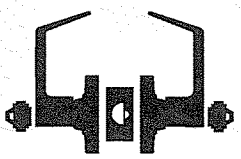
Schlage ANSI

ND60PD F88

Vestibule lock

- Latch retracted by key from outside when outside lever is locked by key in inside lever.
- Inside lever always free for immediate egress.

Outside Inside



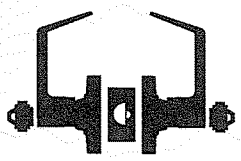
Schlage ANSI

ND66PD F91

Store lock†

- Key in either lever locks or unlocks both levers.

Outside Inside



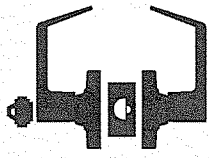
Schlage ANSI

ND70PD F84

Classroom lock

- Outside lever locked and unlocked by key.
- Inside lever always free for immediate egress.

Outside Inside



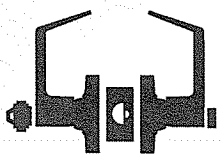
Schlage ANSI

ND73PD F90

Corridor lock

- Locked or unlocked by key from outside.
- Push-button locking from inside.
- Turn inside lever or close door to release button.
- When outside lever is locked by key it can only be unlocked by key.
- Inside lever always free for immediate egress.

Outside Inside



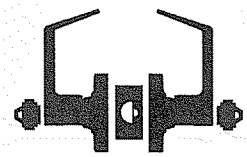
Schlage ANSI

ND75PD -

Classroom security lock

- Key in either lever locks or unlocks outside lever.
- Inside lever always free for immediate egress.

Outside Inside



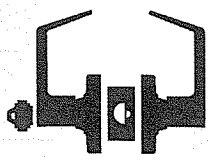
Schlage ANSI

ND80PD F86

Storeroom lock

- Outside lever is fixed.
- Entrance by key only.
- Inside lever always free for immediate egress.

Outside Inside



Available with RX

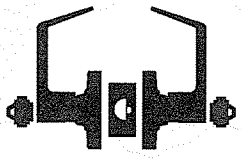
Bid Set - Not For Construction 3/11/2019

ND Series mechanical lock
Keyed function list

Schlage	ANSI
ND82PD	**F87**
Institution lock†	

- Both levers always fixed.
- Entrance by key in either lever.

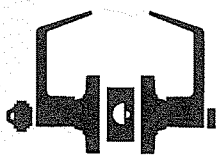
Outside Inside



Schlage	ANSI
ND85PD	-
Faculty restroom lock	

- Outside lever is fixed.
- Entrance by key only.
- Visual occupancy indicator, allowing only emergency key to operate.
- Turn inside lever or close door to unlock.
- Rotation of inside spinner-button enables lock-out feature.
- Inside lever always free for immediate egress.
- Not available with interchangable core cylinders.

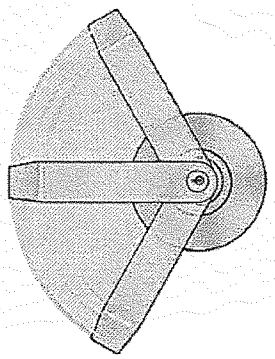
Outside Inside



Electrified locks can be found in the electrified section of the catalog (page 19).

Bid Set - Not For Construction 3/11/2019

Vandlgard™ trim is specifically designed for highly abusive environments. The outside lever rotates freely up and down when locked, limiting the ability of vandals to apply excessive force to the chassis



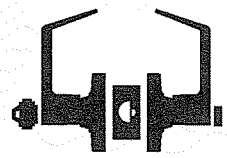
Schlage ANSI

ND91PD F82

Entrance/office lock

- Push-button locking.
- Push-button disengages outside lever until unlocked with key or by turning inside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside Inside



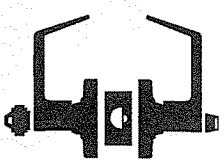
Schlage ANSI

ND92PD F109

Entrance lock

- Turn/push-button locking: Pushing and turning button disengages outside lever, requiring using of key until button is manually unlocked.
- Push-button locking: Pushing button disengages outside lever until unlocked by key or by turning inside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside Inside



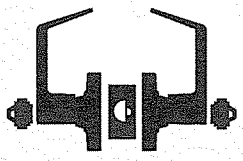
Schlage ANSI

ND93PD F88

Vestibule lock

- Latch retracted by key from outside when outside lever is disengaged by key in inside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside Inside



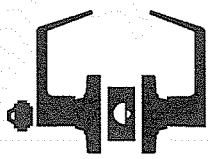
Schlage ANSI

ND94PD F84

Classroom lock

- Outside lever disengaged and unlocked by key.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside Inside



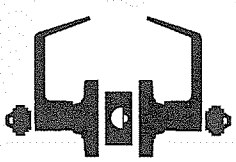
Schlage ANSI

ND95PD -

Classroom security lock

- Key in either lever locks or unlocks outside lever.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside Inside



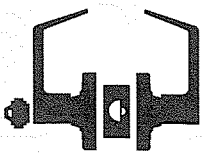
Schlage ANSI

ND96PD F86

Storeroom lock

- Outside lever always disengaged.
- Entrance by key only.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside Inside



Available with RX

Bid Set - Not For Construction 3/11/2019

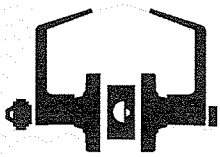
Schlage ANSI

ND97PD **F90**

Corridor lock

- Locked or unlocked by key from outside.
- Push-button locking from inside.
- Turning inside lever or closing door releases button.
- When outside lever is locked by key it can only be unlocked by key.
- Vandlgard allows outside spindle to disengage from latch when locked.
- Inside lever always free for immediate egress.

Outside **Inside**



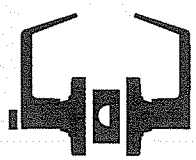
Schlage ANSI

ND45 -

Time out lock

- Pushing and holding outside button disengages inside spindle, allowing inside lever to free-wheel without retracting latch. Release of outside button allows free egress from inside.

Outside **Inside**



ND Series other special functions

ND30D

Patio lock

Push button locking. Turning inside lever or closing door releases button, preventing a lock-out. Inside lever always free for immediate egress. Specify per XN12-007.

ND25 x 80PD

Storeroom exit lock

Blank plate outside. Key in fixed inside lever retracts latch. Specify per XN12-005.

ND25 x 70PD

Classroom exit lock

Blank plate outside. Key locks or unlocks inside lever. Specify per XN12-004.

ND60PD

Vestibule with closed outside lever

Same as ND60 except outside lever is closed. Inside lever always free for immediate egress. Specify per XN12-001.

ND70 x 80PD

Classroom by storeroom lock

Key locks and unlocks outside lever. Key in fixed inside lever retracts latch. Specify per XN12-006.

ND72PD

Communicating lock

Key in either lever locks and unlocks respective lever. Specify per XN12-002.

ND72PD

Vandlgard communicating lock

Communicating, ND72, lock with Vandlgard. Key in either lever locks and unlocks own lever. Both inside and outside levers are clutching. Specify per XN12-003.

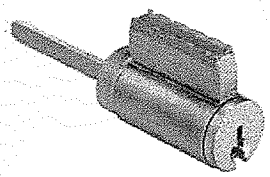
Electrified locks can be found in the electrified section of the brochure (page 18).

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Cylinders and key systems

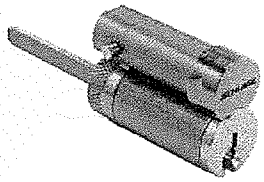
A strong lock is only part of the security solution—proper key control is equally important. Schlage offers extensive options to meet the security needs of the specific project.

Cylinders



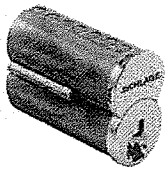
Conventional KIL cylinder options[1]

- 6-pin length (standard)
- 7-pin length in SL cylinder
- Available in Schlage Classic and Everest 29™ open and restricted keyways
- Primus® XP security features and geographic exclusivity
- Primus XP UL 437 listed high security features
- Hotel cylinder (for use in faculty restroom function)



Full size interchangeable core (FSIC) options[1]

- 6-pin length
- Available in Schlage Classic and Everest 29 open and restricted keyways
- Interchangeable core compatible with conventional cylinder key systems
- Primus XP security features and geographic exclusivity



Small format interchangeable core (SFIC) options[2]

- 7-pin combinated Everest 29 R restricted keyways[3]
- 6 or 7-pin uncombinated Falcon®/ Best® keyways[4]

1 Available in 606, 622, 626 and 643 plug face finishes; Everest 29 S123 keyway standard.
2 Available 606, 613 (simulated), 622, 626 and 643e finish only.
3 Restricted keyway cores require authorization from the end user.
4 Must be ordered separately from lock; not available factory keyed.

Key systems

Classic keyway

- Open keyway—keys are duplicated and available without ordering formalities
- Upgradeable to Primus XP and UL 437 levels of security

Everest 29

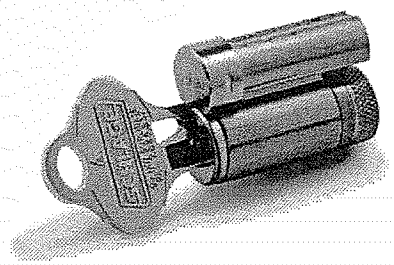
- Patented through 2029
- Key duplication is restricted providing a higher level of security for the cylinder
- Can be integrated to an existing Everest B, C, or D system
- Upgradeable to Primus XP and UL 437 levels of security

Primus XP

- Independent, dual locking mechanisms
- Unique side bit milling on key makes unauthorized duplication highly enforceable
- Allows creation of geographically exclusive keys in a thousand available combinations
- Provides patent protection when applied to Schlage Classic keyways
- Compatible to all Everest and Everest 29 keyways

Everest 29 SL

- A high security conventional (KIL) cylinder pinned on an A2 system compatible with the Schlage Everest B and Everest 29 R keyways
- Users can expand existing Everest B and Everest 29 R key systems
- Enables Primus XP and UL 437 upgrades on SFIC keyways



Bid Set - Not For Construction 3/11/2019

Readers and credentials

Schlage's comprehensive portfolio of electronic credentials and wall mount readers are designed to provide enhanced levels of security, efficiency and convenience to any facility.

Proximity (125 kHz) technology:

- Basic open contactless technology; recommended for legacy systems only
- Encoded with a unique number that cannot be updated or changed

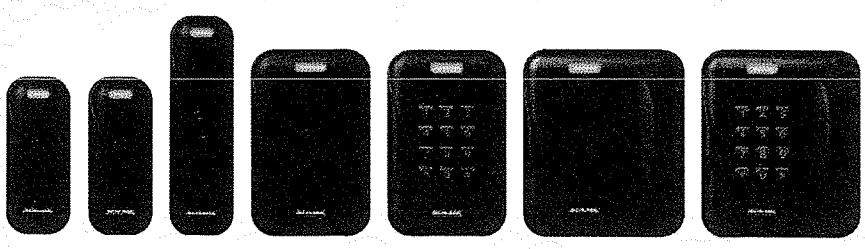
Smart (13.56 MHz) technology:

- Advanced contactless technology, more secure than magnetic stripe and proximity options
- Advanced data encryption secures against duplication
- Recommended for new systems
- Open platform, designed to work with a wide array of systems and applications beyond access control

Multi-technology options that provide flexibility:

- All multi-technology credentials and readers feature aptiQ technology with either magnetic stripe or proximity
- Enables migration from legacy platform to secure smart technology
- Reader options available with keypad for +PIN for high security applications

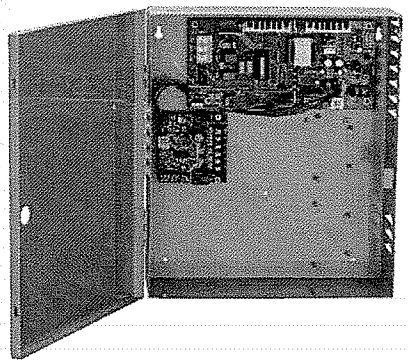




Credentials
Options include clamshell or ISO cards, keyfobs, wristbands and mobile.

Readers
Single-technology proximity (PR) and smart (SM) readers available in a mini mullion design. Multi-technology (MT) options include mullion, single gang and single gang with keypad (K).

Power supplies



Schlage power supplies are designed for speed and ease of installation upfront with the assurance post installation of the highest quality output in terms of even power flow to protect downstream devices.

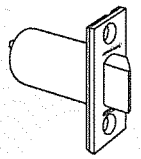
Bid Set - Not For Construction 3/11/2019

Latches

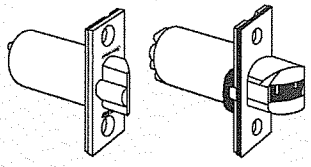
ND latches are adjustable for flat or beveled edge doors, and are finished to match the lock trim. All ND Series latches have ½" throw and 1" housings except the anti-friction fire door latch, which has a ¾" throw. Please see the Schlage pricebook for more options including extended backset strikes (up to 5") and rabbited latch and strike kits.

	Part number	Backset	Description
Springlatch	13-248	2 ¾"	Square corner, 1 ⅛" x 2 ¼" (default springlatch)
	14-010	3 ¾"	Square corner, 1 ⅛" x 2 ¼"
Deadlatch	14-047	2 ⅜"	Square corner, 1 ⅛" x 2 ¼"
	14-048	2 ⅜"	Square corner, 1" x 2 ¼"
	13-247	2 ¾"	Square corner, 1 ⅛" x 2 ¼" (default deadlatch)
	14-042	2 ¾"	Anti-friction fire door latch (¾" throw)
	14-028	3 ¾"	Square corner, 1 ⅛" x 2 ¼"

Springlatch



Deadlatch



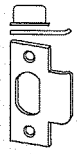
¾" throw anti-friction deadlatch for pairs of fire doors

Strikes

The ND Series is available with both T-Strike and ANSI strikes in a variety of lip lengths to accommodate different door preps.

	Part number	Description
T-strike	10-013 xx	T-strike, square corner, with strike box, 1 ⅛" x 2 ¾". Specify lip length (xx) as 1 ⅛" or 1 ½". For ND and wired ND only.
	10-016	T-strike, square corner, with deep strike box, for fire door latch. 1 ⅛" x 2 ¾" w/ 1 ⅛"" lip. For ND and wired ND only.
	10-132 xx	T-strike, square corner, with strike box, DPS magnet, 1 ⅛" x 2 ¾". Specify lip length (xx) as 1 ⅛" or 1 ½". For NDE only.
	10-133 xx	T-strike, square corner, with deep strike box, DPS magnet, for fire door latch. 1 ⅛" x 2 ¾" w/ 1 ⅛" lip. For NDE only.
ANSI	10-025 xx	ANSI, no box, 1 ¼" x 4 ⅞". Specify lip length (xx) as 1 3/16", 1 ⅜" or 1 ½" (1 3/16" lip is default strike). For ND and wired ND only.
	K510-066	Box for ANSI strike.
	10-130 xx	ANSI, no box, DPS magnets, 1 ¼" x 4 ⅞". Specify lip length (xx) as 1 3/16", 1 ⅜" or 1 ½" (1 3/16" lip is default strike). For NDE only.

T-strike (10-013) 1⅛" x 2¾" x 3/32"



ANSI strike - standard (10-025) 1¼" x 4⅞" x 3/32"



Non-Schlage cylinders

The ND lock can accommodate cylinders from a variety of manufacturers, provided it is specified when ordering the lock.

Cylinder type	Cylinder code
Sargent KIL[1]	L-SAR
Sargent FSIC[1]	J-SAR
CR KIL[1]	L-CO6
CR FSIC[1]	J-CO6
CR FSIC 7-pin[2]	J-CO7

Cylinder type	Cylinder code
Yale FSIC[1]	J-YA6
Yale FSIC 7-pin[2]	J-YA7
Medeco 31[1]	J-YA6
Medeco 32[1]	J-MED
Best	see SFIC cylinder instructions page 25

[1] Available in ATH, RHO, SPA, TLR lever designs only.
[2] CR and Yale FSIC 7-pin available RHO only.

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Ordering instructions

Example

		Outside		Inside		Door				
	Function + cylinder	Lever	Finish	Lever	Finish	Latch	Strike	Thickness	Extension	Dimension
Mechanical	ND53PD	ATH	626							
Wired electrified	ND80EUL	RHO	605	SPA	619	14-048	10-013	214	EE	118
Wireless electronic	NDE80BD	SPA	619							

Detail

Function	Mechanical: See pages 12-17 Wired electrified: See pages 18-19 Wireless electronic: NDE80; see pages 20-21		
Cylinder	Standard: P (Patented Everest 29) L (less cylinder) C (less double cylinder) Z (Everest SL)	Full size Interchangeable (FSIC): R (FSIC, Patented Everest29) J (FSIC, less core) T (FSIC, Construction Core)	Small format Interchangeable: GD (SFIC, Patented Everest 29) BD (SFIC, less core) BDC (SFIC, disposable core) HD (SFIC, construction core)
	For non-Schlage cylinders please see page 24		
Outside lever	ATH (Athens), RHO (Rhodes), SPA (Sparta), TLR (Tubular), OME (Omega), LAT (Latitude), LON (Longitude), BRW (Broadway), BRK (Boardwalk) Note: Specify tactile as: 8AT (Athens), 8RO (Rhodes), 8SP (Sparta), 8TR (Tubular), 8LT (Latitude), 8LN (Longitude), 8BY (Broadway), 8BK (Boardwalk)		
Outside finish	605 Bright brass (US3) 606 Satin brass (US4) 612 Satin bronze (US10) 613 Oil rubbed bronze (US10B)[1] 619 Satin nickel (US15) 622 Matte black (US19) 626 Satin chrome (US26D) 626AM Satin chrome anti-microbial 625 Bright chrome (US26) 643e Aged bronze (US11) [1] Not available NDE wireless electronic		
Inside lever	Specify only if different from outside lever. Same options as outside lever.		
Inside finish	Specify only if different from outside finish. Same options as outside finish.		
Latch	Specify only if different from standard latch; see page 24 for options.		
Strike	Specify only if different from standard strike; see page 24 for options.		
Door thickness	Specify only if outside standard door range (1 5/8"-2 1/8"). Extended door thickness not available NDE wireless electronic.		
Extension	Specify only for doors 2 1/8" or greater. Example: EE = Extended Equally, EI = Extended Inside, EO = Extended Outside, ED = Extended Differently		
Dimension	Specify only for non-standard strike lip length.		
Options	Specify any additional requirements or options. Example: KA = Keyed Alike, KD = Keyed Different, Obit, etc.		

Bid Set - Not For Construction 3/11/2019

Product specifications

		ND mechanical and ND wired electrified	NDE wireless electronic
Chassis	Material	Modular design of zinc and steel components plated for corrosion protection	
	Door thickness	Standard: 1 5/8" to 2 1/8" Optional: 1 3/8" - 6" EE, EO, EI, ED configurations	Standard - 1 5/8" to 2"
Trim	Handing	Non-Handed	Default to Right Hand, configurable without tools
	Levers	Standard: Nine designs, pressure cast zinc, plated to match product finish specification Optional: Tactile feature - Athens (ATH), Rhodes (RHO), Sparta (SPA), Tubular (TLR), LAT (Latitude), LON (Longitude), BRW (Broadway), BRK (Boardwalk)	
	Roses	Wrought brass, bronze, or zinc, plated to match product finish specification	Zinc, plated to match product finish specification
	Finishes	10 available (605, 606, 612, 613, 619, 622, 625, 626, 626AM, 643e)	9 available (605, 606, 612, 619, 622, 625, 626, 626AM, 643e)
Latches	Backset	Standard: 2 3/4" Optional: 2 3/8", 3 3/4", 7 3/4"	Standard: 2 3/4" Optional: 2 3/8"
	Faceplate	Standard: 1 1/8" x 2 1/4" Optional: 1" x 2 1/4" for 2 3/8" backset doors	Standard: 1 1/8" x 2 1/4"
	Bolt	Standard: 1/2" throw via Oil Impregnated Stainless Steel Optional: 3/4" throw anti-friction bolt available for pairs of doors	
	Strike	Standard: ANSI Curved Lip: 1 1/4" x 4 7/8" x 1 3/16" Optional: T Strike, ANSI strikes with alternative lip lengths, dust box options	
Keying	Formats	Standard: 3 Schlage (KIL or FSIC or SFIC) Optional: 10 Non-Schlage including cylinders from Best, Corbin Russwin, Medeco, Sargent and Yale	
	Access security	Standard: 6-Pin Patented Everest 29 Optional: Open, Restricted, Primus, master keying, construction keying	
Wired electrified	Input voltage	Autodetecting 12-24V DC, +10%	—
	Operating mode	Fail Safe or Fail Secure via switch on chassis	—
	Current draw	0.23 amps maximum; 0.01 amps holding	—
	Request to Exit	Modular - 3A @ 125VAC / 2A @ 30VDC	—
Wireless electronic	Input voltage	—	4 AA batteries
	Operating mode	—	Selectable - secured, as-is, or passage
	Communication	—	2.4 GHz Wi-Fi (IEEE 802.11b/g) Bluetooth low energy (version 4.0)
	Request to Exit	—	Integrated into chassis
	Door position sensor	—	Integrated magnetometer with strike and magnet assembly. Includes magnetic tamper alert.
	Tamper sensor	—	Integrated interior cover tamper
Warranty	Mechanical	10 years mechanical, 1 year wired electrified	1 year wireless electronic
Certifications	ANSI/BHMA	All ND Series comply with A156.2 performance requirements for grade 1 cylindrical locks. Wired electrified complies with A156.25 (indoor), wireless electronic complies with A156.25 (indoor/outdoor) requirements for electrified locking devices	
	ICC	Complies with ICC A117.1 Accessible and Usable Buildings and Facilities	
	UL/cUL	All locks 3 hour A label single firedoor 4'0" x 10'0"; pair doors 3 hour firedoor 8'0" x 8'0" with 3/4" latch option; pair doors 90 minute fire 8'0" x 10'0" with 3/4" latch option	
	CA Fire Code	All levers with a return to door of 1/2" (64 mm) or less comply (Rhodes, Sparta, Tubular, Omega, Longitude and Boardwalk)	
	FL Building Code	Complies with Florida Building Code (ASTM E330, E1886, E1996) and Miami Dade (TAS 201, 202, 203) requirements for hurricanes	
	Federal	Meets FF-H-106C Series 161	—
	Other	—	UL294, CSA C22.2 No. 205-M1983, FCC Part 15, IC RSS-210, RoHS

Bid Set - Not For Construction 3/11/2019

General specifications - applies to mechanical, wired electrified & NDE wireless electronic

1. Provide Schlage ND Series cylindrical locks conforming to the following standards and requirements:
   a. ANSI/BHMA A156.2 Series 4000, Grade 1
   b. UL10C for 4'0" x 10'0" 3-hour firedoor
   c. Florida Building Code (ASTM E330,E1886, E1996) and Miami Dade (TAS 201, 202, 203) requirements for hurricanes
2. Provide cylindrical locks **exceeding** the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security and durability in the categories below[1]:
   a. **Abusive locked lever torque** – minimum 3,100 inch-pounds without gaining access
   b. **Offset lever pull** – minimum 1,600 foot pounds without gaining access
   c. **Vertical lever impact** – minimum 100 impacts without gaining access
   d. **Cycle life** – minimum 16 million cycles
      1 With no visible lever sag
      2) Without the use of performance aids (i.e. – set screws, spacers, etc.)
3. Provide locksets with **solid cast levers** and **wrought roses** on both sides. **(ND mechanical, ND wired electrified)**
   a. Lever design: Rhodes, Athens, Sparta, Tubular, Omega, Latitude, Longitude, Broadway or Boardwalk
   b. Rose design: Rhodes (used with Rhodes, Athens, Sparta, Tubular, Latitude, Longitude, Broadway or Boardwalk levers) or Omega (used with Omega lever)
   c. **OPTION** (where required by Authority Having Jurisdiction)- Provide tactile warning on levers on exterior (secure side) of doors serving rooms or areas considered to be hazardous.
   d. **OPTION** - Provide break away Rhodes levers for an additional level of security
4. Provide locksets with **solid cast levers** and **cast escutcheons** on both sides **(NDE wireless electrified)**
   a. Lever design: Rhodes, Athens, Sparta, Latitude, Longitude, Broadway or Boardwalk
   b. **OPTION** (where required by Authority Having Jurisdiction)- Provide tactile warning on levers on exterior (secure side) of doors serving rooms or areas considered to be hazardous.
   c. OPTION - Provide break away Rhodes levers for an additional level of security
5. Provide locksets with **solid steel anti-rotation** through bolts and posts to control excessive lever rotation
6. Provide **independently operating levers** with two external return spring cassettes mounted under roses to prevent lever sag.
7. **OPTION/Standard NDE wireless electrified** – Provide Vandlgard/Free-Wheeling levers with vandal resistant technology for use at heavy traffic or abusive applications.
8. **OPTION** - Provide cylindrical locks with an inside indicator feature on a 626 finish for the Rhodes and Omega roses that provides clear direction for users to safely and quickly secure the room
   a. **ND75 and ND95 – Standard**
   b. **ND60 and ND93 – OPTION**
9. Provide locks with **standard latches** featuring a 2 ¾" (70 mm) backset and a ½" latch throw capable of UL listing of 3 hours on a 4.0 x 10.0 opening. Provide proper latch throw for UL listing at pairs.
10. Provide standard **ASA strikes** unless extended lip strikes are required to protect trim.
11. **OPTION ND mechanical** – Provide reconfigurable lockset chassis that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts

Add for ND wired electrified

12. Provide wired electrified options as scheduled in the hardware sets.
    a. 12 through 24V DC operating capability, autodetecting
    b. Selectable EL (Fail Safe)/EU (Fail Secure) operating mode via switch on chassis
    c. 0.230A (230mA) maximum current draw
    d. 0.010A (10mA) holding current
    e. Modular / "plug in" Request to Exit switch

Add for NDE wireless electronic

12. Provide lockset with additional standard compliance:
    a. Listed, UL 294 - standard of Safety for Access Control System Units
    b. Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security
    c. Certified to FCC Part 15
13. Provide credential reader module in the following configuration, as indicated in the door hardware sets. Multi-technology contactless reader shall be NFC-Compatible, including NFC Peer to Peer compatibility, and read access control data from both 125 kHz and 13.56MHz contactless smart cards.
14. Provide lockset with the following switches/monitors standard:
    a. Door Position Sensor (DPS)
    b. Interior cover tamper guard
    c. Request to Exit (RX) switch
15. Provide locksets with the following features
    a. Ability to communicate unit's communication status
    b. Visual tri-colored LED indicator that indicates activation, oerational systems status, system error conditions and low power conditions
    c. Audible feedback that can be enabled or disabled
    d. Tamper resistant torx screw on inside escutcheon
16. Provide lockset with open architecture characteristcs capable of handling new and existing access control software and credential reading technology
17. Provide lockset powered by four AA batteries
    a. Provide locksets able to communicate battery status and battery voltage level by means of application on mobile device at the door or remotely via integrated software

1 Beyond grade 1 performance for ND locks with Schlage cylinders only (standard, FSIC and SFIC). Performance with non-Schlage cylinders will exceed BHMA Grade 1 requirements but may be less than the performance of products with Schlage cylinders.

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About Allegion

Allegion (NYSE: ALLE) is a global pioneer in safety and security, with leading brands like CISA®, Interflex®, LCN®, Schlage®, SimonsVoss® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion produces a range of solutions for homes, businesses, schools and other institutions. Allegion is a $2 billion company, with products sold in almost 130 countries.

For more, visit **www.allegion.com**

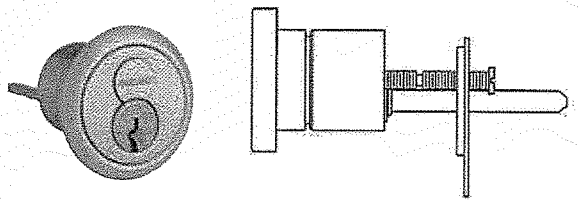
KRYPTONITE ■ LCN ■ SCHLAGE ■ STEELCRAFT ■ VON DUPRIN

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006501, Rev. 12/17
www.allegion.com/us

ALLEGION™

Bid Set - Not For Construction 3/11/2019

Full size interchangeable core cylinders for exit devices, aluminum door, etc.



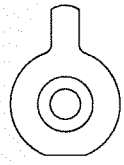
Interchangeable core rim cylinders for exit devices	
Number	Core mechanism
20-057	Conventional core
20-757	Primus core
20-757-XP	Primus XP core
20-079	Housing only, less core

Available in 605, 606, 609, 612, 613, 619, 625, 626, and 643e finish.



Cylinders for Adams Rite MS and 4700 Series Lori 4500 Series and Corbin Russwin DL3000 Series		
Number	Core mechanism	Collar
26-098	Conventional core	Compression ring & spring
20-062	Conventional core	3/16" + 3/8" blocking rings
20-766	Primus core	3/16" + 3/8" blocking rings
20-766-XP	Primus XP core	3/16" + 3/8" blocking rings
20-060	Housing less core	None

These cylinders include set screw pack B220-050 for Adams Rite locks.



K510-711
Adams Rite
MS cam

Cylinders for Adams Rite 4070 Series deadlocks		
Number	Core mechanism	Collar
20-091	Conventional core	3/16" + 3/8" blocking rings
20-722	Primus core	3/16" + 3/8" blocking rings
20-722-XP	Primus XP core	3/16" + 3/8" blocking rings
20-090	Housing less core	None

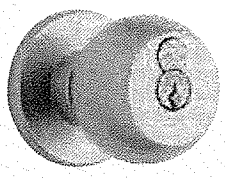


B520-378
Adams Rite
4070 cam

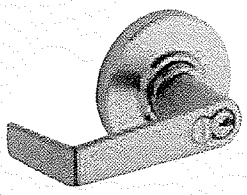
Notes
1. Mortise cylinders available 605, 606, 609, 612, 613, 619, 625, 626, and 643e finish. Cores furnished 606 and 626 only.
2. To differentiate between Classic and Everest 29, specify keyway. Example: C or CP (Classic), S123 (Everest 29).
3. All cylinders are 1 1/2" long.
4. Specify LKB if 0-bitted Primus XP cylinders are required less key blanks.

Bid Set - Not For Construction 3/11/2019

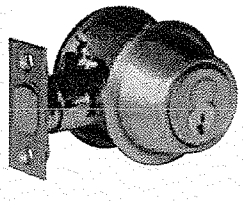
Full Size Interchangeable Core Availability



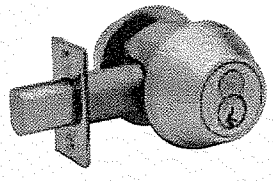
A-Series
Orbit design



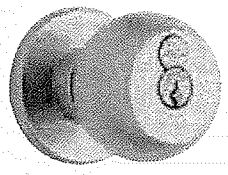
AL-Series
Saturn design



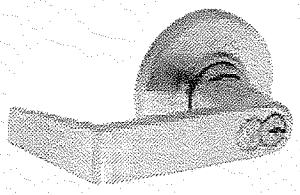
B500-Series



B600 / 700-Series



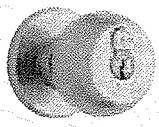
D-Series knob
Orbit design

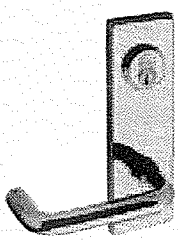


ND-Series lever
all designs

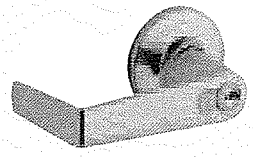


H-Series knob
Orbit design





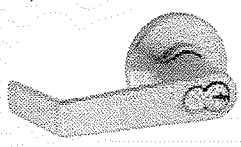
L-Series
all designs
except concealed



S-Series
all designs
except Flair



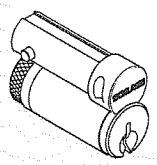
S200-Series
all designs for S210



All except Flair for other functions

Bid Set - Not For Construction 3/11/2019

Full Size Interchangeable Core Cylinders for Schlage Locksets



Full Size Core Only

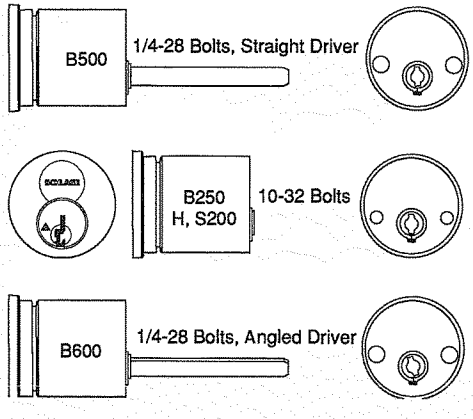
Number	Mechanism
23-030	Conventional core
30-120	Conventional core for hotel function (specify hand)
20-740-XP	Primus XP core (not available in hotel function)

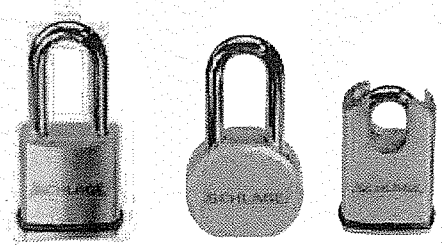
Available 606 and 626 finish only. Order control keys separately.

Full Size IC Housings for Bored Deadlocks, Less Core

Lockset Series	Description	Number	Specify Finish
BS00-Series	Outside	B610-203, B610-20S	605, 609, 612, 613, 619, 625, 626, and 716
	Inside	B610-028**	605, 609, 612, 613, 619, 625, 626, and 716
B250, H, 5200-Series	Outside	22-061	605, 606, 609, 610, 611, 612, 613, 616, 625, 626
	Inside of B2S2	22-062	
B600 / 700-Series	Outside	B610-027	60S, 606, 609, 612, 613, 625, 626
	Inside	B610-028	See Note Below

Specify finish of B610-031 inside snap-on faceplate ordered separately for BC162 and B662/762.
**Inside housing does not include snap-on faceplate

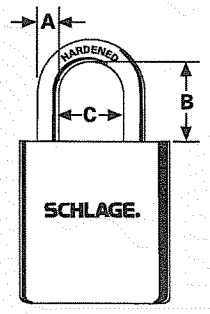




KS43F KS72F KS92M

Full Size Interchangeable Core Padlocks

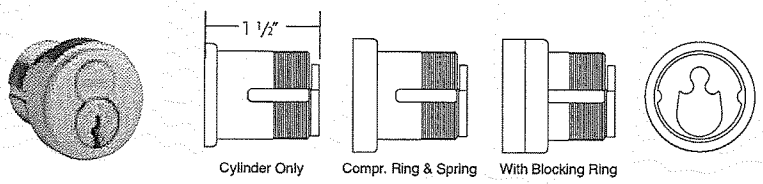
Part #	Shackle Dimensions		
	A	B	C
LESS CYLINDER - FULL SIZE INTERCHANGEABLE CORE			
BRASS BODY			
KS43A3200	3/8"	3/4"	3/4"
K543D3200	3/8"	1 1/2"	3/4"
K543F3200	3/8"	2"	3/4"
KS43G3200	3/8"	4"	3/4"
STEEL BODY			
K572M3200	7/16"	1"	7/8"
K572F3200	7/16"	2"	7/8"
K592M3200	3/8"	1"	3/4"



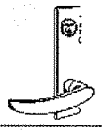
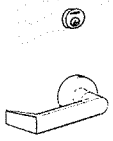
Note: To order Primus XP add the suffix - XP to the Primus part number. (Example: 12-345-XP)

Bid Set - Not For Construction 3/11/2019

Full Size Interchangeable Core Mortise Cylinders



Cylinders for Schlage L-Series Mortise Locks

	Design	Function	Core Mechanism		
			Conventional	Primus, Primus XP	Housing Less Core
	**L & N Escutcheons** (cylinders with compression ring)	All Except Below	30-008	20-798, 20-798-XP	30-007
		L9060P Outside	30-030	20-782, 20-782-XP	30-032 + 36-083
		L9485P, L9486P Hotel Funtions	30-010*	N/A	30-007
	**Sectional Trim** (cylinder with compression ring, spring and 3/8" blocking ring). 9060 requires 1/2" blocking ring.	All Except Below	30-138	20-776, 20-776-XP	30-137
		L9060P Outside	30-030 + 36-083 + 35-082-030	20-783, 20-783-XP	30-032 + 36-083 + 36-082-050
		L9485P, L9486P Hotel Funtions	30-040*	N/A	30-137

* Hotel function cores are handed. Specify hand of door.



L583-489
Cam for All Functions Except L9060 Outside



K510-680
Cam for L9060 Outside

Mortise Cylinders with Straight Cam for Exit Devices

Number	Core Mechanism	Collar
26-091	Conventional core	Compression ring & spring
20-061		3/8" blocking rings + compression ring & spring
20-763, 20-763-XP	Primus/Primus XP core	Compression ring & spring
20-771, 20-771-XP		3/8" blocking rings + compression ring & spring
20-059	Housing less core	None
26-064		Compression ring & spring

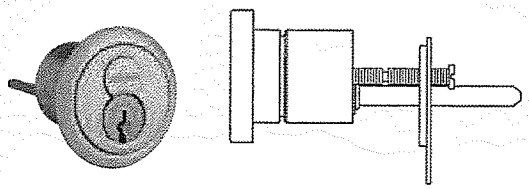


KS10-730
Straight Cam, Other Applications

Notes 1. Available 605, 606, 609, 610, 612, 613, 625, and 626 finish. Cores furnished 606 and 626 only.
2. To differentiate between Classic and Everest, specify keyway. Example: C or CP (Classic), C123 (Everest). Everest C123 keyway standard.
3. All cylinders are 1 1/2" long.
4. Specify LKB if 0-bitted Primus XP cylinders are required less key blanks.

Bid Set - Not For Construction 3/11/2019

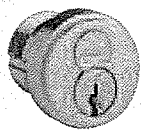
Full Size Interchangeable Core Cylinders for Exit Devices, Aluminum Doors, etc.



Interchangeable Core Rim Cylinders for Exit Devices

Number	Core Mechanism
20-057	Conventional core
20-757	Primus core
20-757-XP	Primus XP core
20-079	Housing only, less core

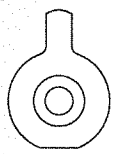
Available 605, 606, 609, 610, 612, 613, 625 and 626 finish.



Cylinders for Adams Rite MS and 4700 Series
Lori 4500 Series and Corbin Russwin DL3000 Series

Number	Core Mechanism	Collar
26-098	Conventional core	Compression ring & spring
20-062	Conventional core	3/16" + 3/8" blocking rings
20-766	Primus core	3/16" + 3/8" blocking rings
20-766-XP	Primus XP core	3/16" + 3/8" blocking rings
20-060	Housing less core	None

These cylinders include set screw pack B220-050 for Adams Rite locks.



K510-711
Adams Rite
MS Cam

Cylinders for Adams Rite 4070 Series Deadlocks

Number	Core Mechanism	Collar
20-091	Conventional core	3/16" + 3/8" blocking rings
20-722	Primus core	3/16" + 3/8" blocking rings
20-722-XP	Primus XP core	3/16" + 3/8" blocking rings
20-090	Housing less core	None

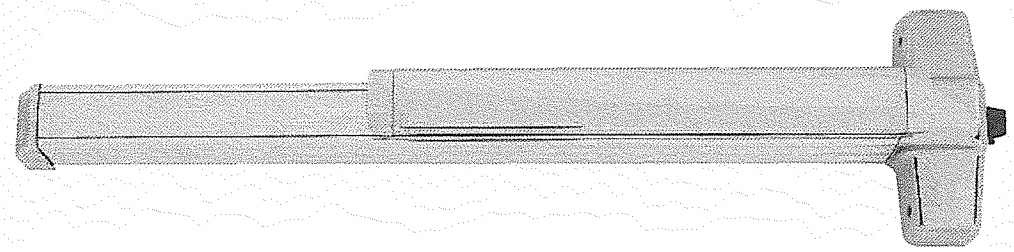


B520-378
Adams Rite
4070 Cam

Notes 1. Mortise cylinders available 605, 606, 609, 610, 612, 613, 625, and 626 finish. Cores furnished 606 and 626 only.
2. To differentiate between Classic and Everest, specify keyway. Example: C or CP (Classic), C123 (Everest).
3. All cylinders are 1 1/2" long.
4. Specify LKB if 0-bitted Primus XP cylinders are required less key blanks.

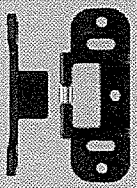
Bid Set - Not For Construction 3/11/2019

98-F/99-F Rim exit device





The 299F Strike ships standard, optional strikes available



499F Strike with 9854/9954 mullion

98-F and 99-F Rim fire exit devices for all types of single doors up to 4' x 10' (1219mm x 3048mm) or 8' x 10' (2438mm x 3048mm) double doors with 9954 or 9854 mullion, UL listed for fire exit hardware. See page 76 for detailed information on UL listed fire exit hardware label and door opening size information. Devices are ANSI A156.3 – 2014 Grade 1. The 98-F device has a smooth mechanism case and the 99-F device has a grooved case. The rim device is non-handed except when the following device options are used: -2 (double cylinder) or SS (signal switch). See opposite page for available outside trim and device functions.

Finishes – US3, US3A, US4, US4A, US10, US26, US26D, US26D-AM Antimicrobial, US28, 313, 315 & 643E. US15 and US32D available with 98 Series only.

Specifications

Device functions	Device ships EO/DT/NL. Field selectable. For TP, K or L remove NL drive screw from device.
Device lengths	3' 2'4" to 3' (711mm to 914 mm) Door size 4' 2'10" to 4' (864 mm to 1219 mm) Door size
Device centerline from finished floor	39 13/16" (1011 mm) 39 11/16" (1008 mm) with mullion
Center case dimensions	8" x 2 3/4" x2 3/8" (203mm x 70mm x 60mm)
Mechanism case dimensions	2 1/4" x 2 1/4" (57mm x 57mm)
Projection	Pushbar neutral – 3 13/16" (97 mm) Pushbar depressed – 3 1/16" (78 mm)
Latch bolt	Deadlocking, 3/4" (19mm) throw
Fasteners & sex bolts (SNB)	Includes screw pack for 1 3/4" (44mm) and 2 1/4" (57mm) thick metal or wood doors. Optional 425 SNB available for metal doors. 425 & 825 SNB required on wood doors without SLM blocking. See page 11 for quantities.
Electric options	**LX** Latchbolt monitor switch **RX** Pushpad monitor switch **RX2** Double pushpad monitor switch **E** Electric locking & unlocking trim **EL** Electric latch retraction **QEL** Quiet electric latch retraction **SS** Signal switch **CX** Chexit delayed exit **ALK** Alarm exit kit **WP-RX** Waterproof request to exit **CON** Allegion Connect
Mechanical options	**-2** Double cylinder **AX** Accessible device **GBK** Glass bead kit **PN** Pneumatic latch retraction **XP** Extra protection **SNB** Sex bolts **SEC** Security screws **SLM** Special Laminate Material Blocking
Dogging option	No mechanical dogging. EL and QEL option available
Strikes	**299F** – Dull black, 499F with mullions

XP
Extra protection
- 90° latch-to-strike contact
- Force resistance of 2,000+ lbs.

RX
Pushpad monitor switch
- Signals use of an opening
- SPDT switch to monitor pushpad

EL
Electric latch retraction
- Enables remote unlatching
- Alternative to manual dogging

ALK
Alarm exit kit
- Unauthorized opening triggers 85-decibel horn
- Set in armed or disarmed mode by key

QEL
Quiet electric latch retraction
- Bolt retraction via switch
- Converts exit door to push-pull operation

CX
Chexit delayed exit
- Meets NFPA 101 requirements
- Self-contained controls, locking, alarm

AX
Accessible device
- UL certified to meet new 5 lb. maximum operating force requirement
- Exceeds ANSI/BHMA requirements

SG
Safety glow
- Shows exit door location in darkness or smoke
- Developed to meet MEA standards

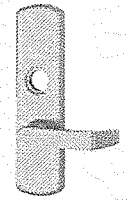
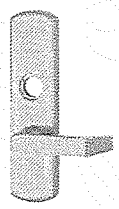
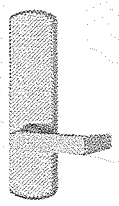
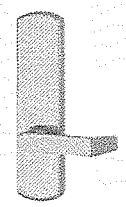
PN
Pneumatic latch retraction
- For areas where electrical devices banned
- Special linkage for mechanical or pneumatic dogging

CON
Allegion Connectors
- Common connectors to connect various door hardware all the way to the power supply

Bid Set - Not For Construction 3/11/2019

Standard trim

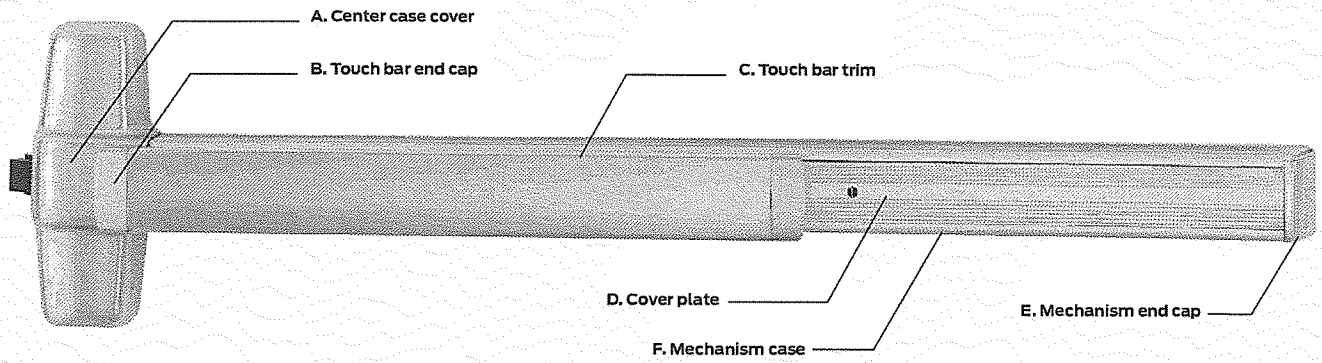
	EO **No outside trim** Exit only	DT  **Dummy trim** Pull when dogged (not recommended for fire device)	NL  **Night latch** Key retracts latchbolt	NL-OP  **Night latch** Key retracts latchbolt optional pull required
Product description	98EO-F 99EO-F	98DT-F 99DT-F	98NL-F 99NL-F	98NL-OP-F 99NL-OP-F
Trim description	—	990DT	990NL-R/V	110NL-MD 110NL-WD
Escutcheon plate size	—	3" x 14 13/16" x 3/32" (76x360x2mm)	3" x 14 13/16" x 3/32" (76x360x2mm)	—
Pull center to center	—	5 1/2" (140mm)	5 1/2" (140mm)	—
Projection	—	2" (51mm)	2" (51mm)	—
ANSI function	01	02	03	03
Cylinder type	—	—	Rim	Rim
Handing	—	—	—	—
Optional trim	x990EO x996EO	x996K-DT x996L-DT x696DT x697DT	x996K-NL x996L-NL x696NL x697NL	
#425 SNB optional - HMD req. WD w/o SLM pkg.	6	2	2	2
#825 SNB req. WD w/o SLM pkg.	2 (if using trim)	2	2	2
#425 SNB req. w/ 499F	2	2	2	2

	L  **Lever** Key locks & unlocks	L-NL  **Lever – night latch** Key retracts latchbolt	L-BE  **Lever – blank escutcheon** Always operable (no cylinder)	L-DT  **Lever dummy trim** pull when dogged (not recommended for fire device)
Product description	98L-F 99L-F	98L-NL-F 99L-NL-F	98L-BE-F 99L-BE-F	98L-DT-F 99L-DT-F
Trim description	996L-R/V*	996L-NL-R/V	996L-BE-R/V*	996L-DT
Escutcheon plate size	2 3/4" x 10 3/4" x 27/32" (70x273x21mm)	2 3/4" x 10 3/4" x 27/32" (70x273x21mm)	2 3/4" x 10 3/4" x 27/32" (70x273x21mm)	2 3/4" x 10 3/4" x 27/32" (70x273x21mm)
Pull center to center	—	—	—	—
Projection	2 7/8" (73mm)	2 7/8" (73mm)	2 7/8" (73mm)	2 7/8" (73mm)
ANSI function	08	03	14	02
Cylinder type	Rim	Rim	—	—
Handing	Handed/Reversible	Handed/Reversible	Handed/Reversible	Handed/Reversible
#425 SNB optional - HMD req. WD w/o SLM pkg.	2	2	2	2
#825 SNB req. WD w/o SLM pkg.	2 (if using trim)	2	2	2
#425 SNB req. w/ 499F	2	2	2	2

* Electrified lever operation available

Bid Set - Not For Construction 3/11/2019

98/99 Finishes



Finishes

Color	US number	BHMA number	A, B, E	C	D & F
Bright brass	US3	605	Bright brass	Bright brass US3, 605	Buffed anodized
Satin brass	US4	606	Bright brass	Satin brass US4, 606	Anodized
Satin bronze	US10	612	Plated	Satin bronze US10, 612	Anodized
Bright chrome	US26	625	Plated	Bright stainless steel US32, 629	Buffed anodized
Satin chrome	US26D	626	Plated	Satin stainless steel US32D, 630	Anodized
Satin stainless steel*	US32D	630	Stainless steel	Satin stainless steel US32D, 630	Anodized
Aluminum, anodized	US28	628	Powder coat	Satin stainless steel US32D, 630	Anodized
Duranodic dark bronze	313	710	Powder coat	Powder coat	Powder coat
Black	315	622	Powder coat	Powder coat	Powder coat
Aged bronze 643E	–	–	Relieved aged bronze	Relieved aged bronze	Aged bronze, no relief

Special Finishes

Color	US number	BHMA number	A, B, E	C	D & F
Satin bronze, oil-rubbed	US10B	613	Oil-rubbed, US10B	Oil-rubbed, US10B	Powder coat
Powder coat**	RAL #	–	Powder coat	Satin stainless steel US32D, 630 (unless specified to match device)	Powder coat
Bright bronze	US9	611	Plated	Bright bronze US9, 611	Buffed anodized
Satin nickel*	US15	619	Plated, clear powder	Satin stainless steel US32D	Anodized
Satin chrome (antimicrobial)	U26D-AM	626-AM	AM Clear over chrome	AM Clear over satin stainless steel US32D, 630	AM Clear over anodized
Satin stainless steel (antimicrobial)	US32D-AM	630-AM	AM Clear over stainless steel	AM Clear over Satin Stainless Steel US32D, 630	AM Clear over anodized

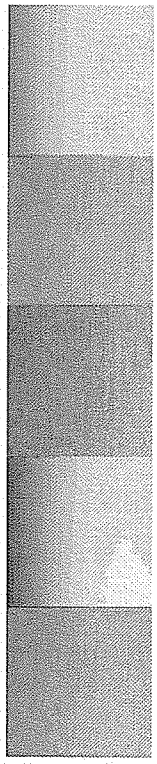
Touch bar trim options — Knurled
Embossed "Push"
Braille (Caution-Stairwell), satin stainless steel only
RSS, US32D only, red silk screen lettered "EMERGENCY EXIT ONLY – PUSH TO OPEN AND SOUND ALARM."

* US32D and US15—available on 98 Series only
** Other custom logo touchbar trim and RAL color combinations available - consult factory

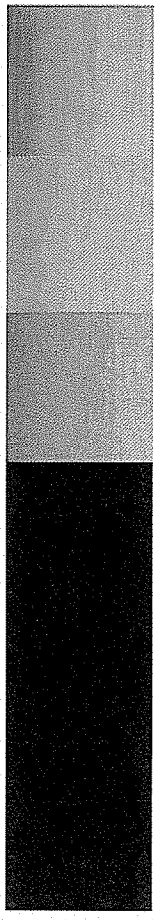
Bid Set - Not For Construction 3/11/2019

98/99 Finishes

Finishes*

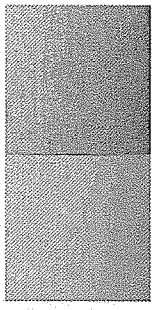


Color	US number	BHMA number
Chromium, polished	US26	625
Anodized, aluminum	US28	628
Chromium, dull	US26D	626
Brass, polished	US3	605
Brass, dull	US4	606



Color	US number	BHMA number
Bronze, dull	US10	612
Satin nickel Available for 35A ONLY	US15	619
Satin stainless steel	US32D	630
Duranodic dark bronze	313	710
Black	315	711
Aged bronze 643e	–	–

Special finishes



Color	US number	BHMA number
Satin chrome, Antimicrobial	US26D-AM	626-AM
Satin stainless steel, antimicrobial	US32D-AM	630-AM

Pushpad options — Knurled
Embossed "Push"
Braille (Caution-Stairwell), satin stainless steel only
RSS – (Emergency Exit – Push to open and sound alarm) – Red Silkscreen lettering on US32D

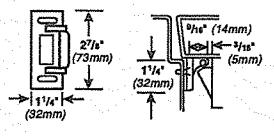
*** Note:** Durable powder coated finishes available at specific special request. PLEASE CONTACT FACTORY.

Bid Set - Not For Construction 3/11/2019

98/99 Strike information

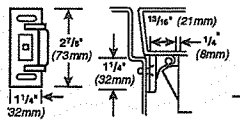
Strikes for rim devices

264



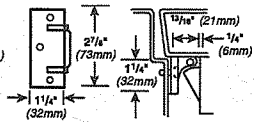
Projection 9/16" (14mm)

299



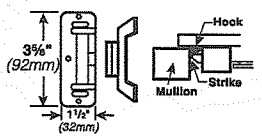
Projection 13/16" (21mm)

299F



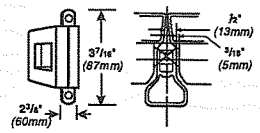
Projection 13/16" (21mm)

499F



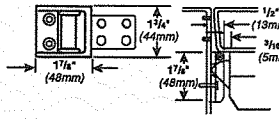
Projection 15/16" (24mm)

1408



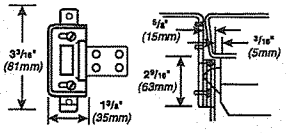
One per pair of doors

1439—Blade stop



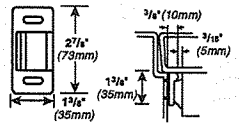
Projection ½" (13mm)

1410—Integral stop



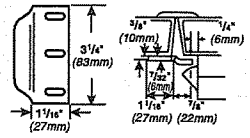
Projection ½" (13mm)

1606



Projection 3/8" (10mm)
Panic devices only

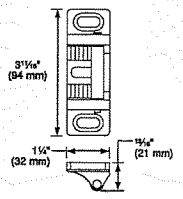
1609



– Requires coordinator
– For panic exit application only, not fire rated

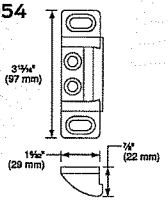
XP Strikes for rim devices

909



Projection 13/16" (21mm)

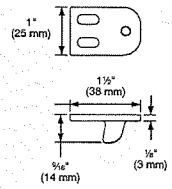
954



Projection 7/8" (22mm)
- For fire rated double door applications

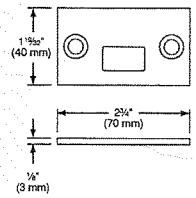
Strikes for vertical cable devices

249 - Top strike



Projection 9/16" (14mm)

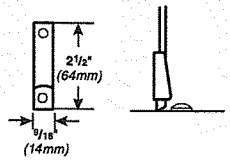
349 - Bottom strike



Projection 1/8" (3mm)

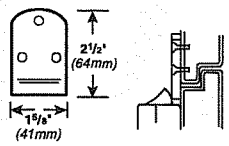
Strikes for vertical rod devices

248L-4



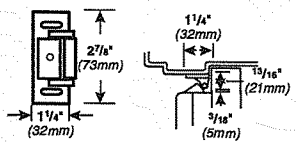
Projection 3/8" (10mm)

260U-Flush transom panic only
260U-F-Flush transom fire only



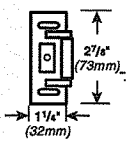
Projection 3/8" (10mm)

299



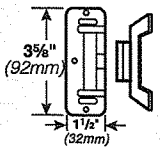
Projection 13/16" (21mm)

299F



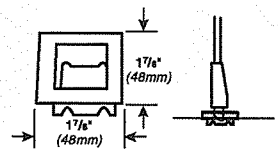
Projection 13/16" (21mm)

499F



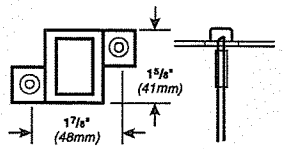
Projection 15/16" (24mm)

304L



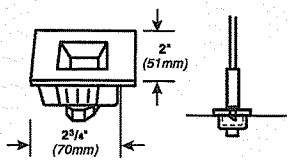
Projection 13/16" (21mm)

338



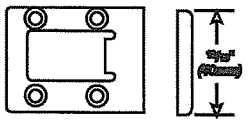
Mortise 5/8" (16mm)

385A



Mortise 2½" (64mm)

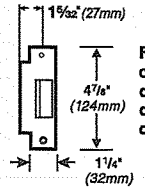
283



For use with WDC devices when used with wood frames

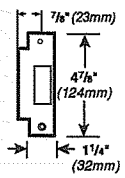
Strikes for mortise lock devices

575



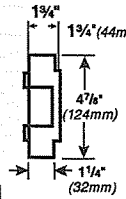
For use on 1¾" (44mm) or 2¼" (57mm) Single door and 2¼" (57mm) double door with coordinator.

575-2



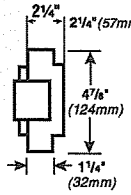
For use on 1¾" (44mm) thick double door with coordinator and astragal.

576A



Open back strike for 1¾" (44mm) thick double doors without coordinator.

576B



Open back strike for 2¼" (57mm) thick double doors without coordinator.

– Not for use with astragals
– For use on wood doors, contact door manufacturer

– Acceptable for 90 minute pair of hollow metal doors

Bid Set - Not For Construction 3/11/2019

98/99 Strike/Stile information

Device type	Standard single door			Standard double door			Optional single door			Optional double door		
	Strike	Trim/Stile		Strike w/ mullion*	Trim/Stile		Strike	Trim/stile		Strike w/mullion*	Trim/Stile	
		990/996	696/697		990/996	696/697		990/996	696/697		990/996	696/697
98/99	299	4 1/2" (114mm)	4 3/8" (111mm)	299 x 4954	4 7/8" (124mm)	4 3/4" (121mm)	1439 or 1410	3 13/16" (97mm)	3 13/16" (97mm)	299 x 5654	4 7/16" (113mm)	4 1/4" (108mm)
										1408 x 5754	3 13/16" (97mm)	3 13/16" (97mm)
							1606	4 1/16" (103mm)	3 15/16" (100mm)	1606 x 1654	4 3/8" (112mm)	4 1/4" (108mm)
XP 98/99	909			909 x 4954-XP			—	—	—	—	—	—
98-F/99-F	299F	4 1/2" (114mm)	4 3/8" (111mm)	499F x 9954	4 7/8" (124mm)	4 3/4" (121mm)	—	—	—	499F x 9854 KR9954	—	—
XP98-F/XP99-F	909			954 x 9954-XP			—	—	—	—	—	—
9875 9975	575	4 3/4" (121mm)	4 3/4" (121mm)	575-2	—	—	—	—	—	576A-5768	4 3/4" (121mm)	4 3/4" (121mm)
9875-F 9975-F	575	4 3/4" (121mm)	4 3/4" (121mm)	575-2	—	—	—	—	—	576A-5768	4 3/4" (121mm)	4 3/4" (121mm)
9857 9957	299 (Top) 299 (Middle) 304L/284-L (Bottom)	4 1/2" (114mm)	4 3/8" (111mm)	299 x 4954	4 7/8" (124mm)	4 3/4" (121mm)	1439 or 1410	3 13/16" (97mm)	3 13/16" (97mm)	299 x 5654	4 7/16" (113mm)	4 1/4" (108mm)
										1408 x 5754	3 13/16" (97mm)	3 13/16" (97mm)
							1606	4 1/16" (103mm)	3 15/16" (100mm)	1606 x 1654	4 3/8" (112mm)	4 1/4" (108mm)
9857-F 9957-F	299 (Top) 299F (Middle) 304L (Bottom)	4 1/2" (114mm)	4 3/8" (111mm)	299F 499F x 9954 304L	4 7/8" (124mm)	4 3/4" (121mm)	—	—	—	—	—	—

	Strike	Application	Trim/Stile		Optional strike	Application	Trim/Stile	
			990/996	696/697			990/996	696/697
9827 9927 Latch retraction	299 (Top) 304L/248-L-4 (Bottom)	Single door	3 11/16" (94mm)	3 5/8" (92mm)	260U (Top) 385A (Bottom)	Single door	3 11/16" (94mm)	3 5/8" (92mm)
PL9827/PL9927 Pullman latch	299 (Top) 304L/248-L-4 (Bottom)	Two vertical rod devices	3 11/16" (94mm)	3 5/8" (92mm)		Two vertical rod devices	3 11/16" (94mm)	3 5/8" (92mm)
9827-F 9927-F	299 (Top) 304L (Bottom)				260U (Stainless) 385A (Bottom)			
9847 9947 9848 9948	338 (Top) 385A (Bottom)	Vertical rod with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)	304L (Bottom)	Vertical rod with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)
9847-F 9947-F 9848-F 9948-F	338 (Top) 385A (Bottom)	Two vertical rods	4 1/4" (108mm)	4 1/8" (105mm)	304L (Bottom)	Two vertical rods	4 1/4" (108mm)	4 1/8" (105mm)
		Vertical rod with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)		Vertical rod with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)
9847WDC 9947WDC	338 (Top) 385A (Bottom)	Single door	4 1/4" (108mm)	4 1/4" (108mm)	304L	Single door	4 1/4" (108mm)	4 1/4" (108mm)
		Two vertical rod devices	4 1/4" (108mm)	4 1/4" (108mm)		Two vertical rod devices	4 1/4" (108mm)	4 1/4" (108mm)
		Vertical rod with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)		Vertical rod with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)
9847WDC-F 9947WDC-F	338 (Top) 385A (Bottom)	Two vertical rod devices	4 1/4" (108mm)	4 1/4" (108mm)	304L	Two vertical rod devices	4 1/4" (108mm)	4 1/4" (108mm)
9849 9949 9849 9949	249 (Top) 349 (Bottom)	Vertical cable with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)	—	Vertical cable with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)
9849-F 9949-F 9849-F 9949-F	249 (Top) 349 (Bottom)	Two vertical cables	4 1/4" (108mm)	4 1/4" (108mm)	—	Two vertical cable	4 1/4" (108mm)	4 1/8" (105mm)
		Vertical cable with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)		Vertical cable with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)
9850WDC 9950WDC	150 (Top) 450 (Bottom)	Single door	4 1/4" (108mm)	4 1/4" (108mm)	—	Single door	4 1/4" (108mm)	4 1/4" (108mm)
		Two vertical cable devices	4 1/4" (108mm)	4 1/4" (108mm)		Two vertical Cable devices	4 1/4" (108mm)	4 1/4" (108mm)
		Vertical cable with Mortise lock device	4 1/4" (108mm)	4 1/4" (108mm)		Vertical cable with Mortise lock device	4 3/4" (121mm)	4 3/4" (121mm)
9850WDC-F 9950WDC-F	150 (Top) 450 (Bottom)	Two vertical cable devices	4 1/4" (108mm)	4 1/4" (108mm)	—	Two Vertical Cable Devices	4 1/4" (108mm)	4 1/4" (108mm)

Bid Set - Not For Construction 3/11/2019

UL Listing for fire exit hardware

UL Listed fire exit hardware label and opening size

Exit device	Door material	Single door	Double door						
			With 9954 mullion	With 9854 mullion	With kr9954 mullion	With kr9854 mullion	V x V same direction	V x mortise same direction	V x V double egress
98-F **99-F**	Metal	3 Hour 4' x 10'	3 Hour 8' x 10'	3 Hour 8' x 10'	3 Hour 8' x 8'	3 Hour 8' x 8'	—	—	—
9875-F **9975-F**	Metal	3 Hour 4' x 10'	—	—	—	—	—	3 Hour 8' x 10'	—
9827-F **9927-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	3 Hour 8' x 10'	3 Hour 8' x 10'
9827LBR-F **9927L8R-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	—	3 Hour 8' x 10'
9857-F **9957-F**	Metal	3 Hour 4' x 8'	3 Hour 8' x 8'	3 Hour 8' x 8'	3 Hour 8' x 8'	3 Hour 8' x 8'	—	—	—
9847-F **9947-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	3 Hour 8' x 10'	3 Hour 8' x 10'
9847L8R-F **9947LBR-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	—	3 Hour 8' x 10'
9848-F **9948-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	3 Hour 8' x 10'	3 Hour 8' x 10'
9849-F **9949-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	3 Hour 8' x 10'	3 Hour 8' x 10'
9849L8L-F **9949L8L-F**	Metal	—	—	—	—	—	90 Minute* 8' x 10'	—	3 Hour 8' x 10'

* Currently, no door manufacturers offer a listing over 90 minutes with doors swinging same direction. Consult wood door manufacturers for current UL listings.

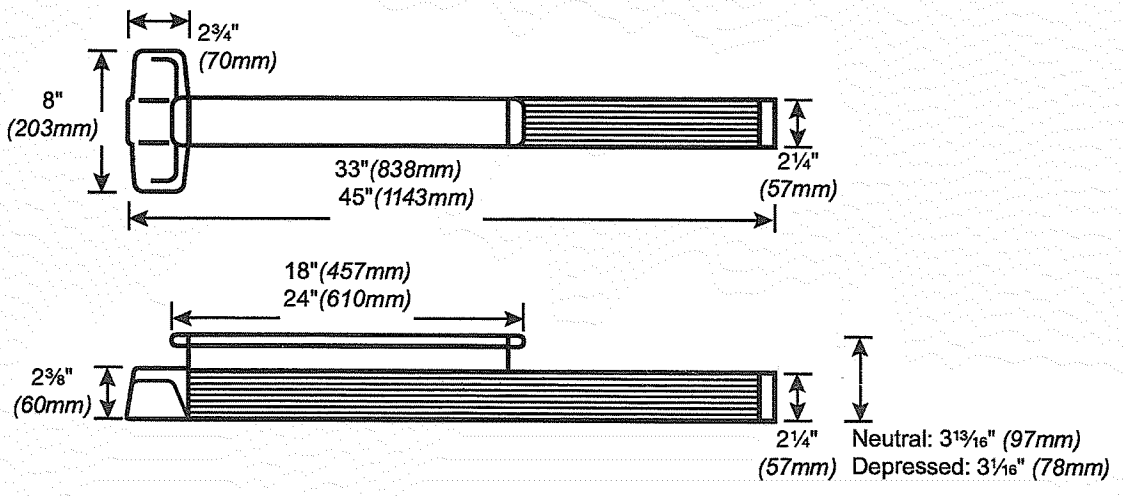
Bid Set - Not For Construction 3/11/2019

98/99 Function, grade, type options

ANSI Function, grade & type

Function	Grade 1, type 1	Grade 1, type 2	Grade 1, type 3	Grade 1, type 7	Grade 1, type 7	Grade 1, type 8	Grade 1, type 8	Grade 1, type 8	Grade 1, type 9
1	98EO & F 99EO & F	9827EO & F 9927EO & F	9875EO & F 9975EO & F	9847WDCEO & F 9947WDCEO & F	9850WDCEO & F 9950WDCEO & F	9847EO & F 9947EO & F	9848EO & F 9948EO & F	9849EO & F 9949EO & F	9857EO & F 9957EO & F
2	98DT 99DT	9827DT 9927DT	9875DT 9975DT	9847WDCDT 9947WDCDT	9850WDCDT 9950WDCDT	9847DT 9947DT	9848DT 9948DT	9849DT 9949DT	9857DT 9957DT
3	98NL & F 99NL & F	9827NL & F 9927NL & F	9875NL & F 9975NL & F	9847WDCNL & F 9947WDCNL & F	9850WDCNL & F 9950WDCNL & F	9847NL & F 9947NL & F	9848NL & F 9948NL & F	9849NL & F 9949NL & F	9857NL & F 9957NL & F
3	98K-NL & F 99K-NL & F	9827K-NL & F 9927K-NL & F	9875K-NL & F 9975K-NL & F	9847WDCK-NL & F 9947WDCK-NL & F	9850WDCK-NL & F 9950WDCK-NL & F	9847K-NL & F 9947K-NL & F	9848K-NL & F 9948K-NL & F	9849K-NL & F 9949K-NL & F	9857K-NL & F 9957K-NL & F
3	98L-NL & F 99L-NL & F	9827L-NL & F 9927L-NL & F	9875L-NL & F 9975L-NL & F	9847WDCL-NL & F 9947WDCL-NL & F	9850WDCL-NL & F 9950WDCL-NL & F	9847L-NL & F 9947L-NL & F	9848L-NL & F 9948L-NL & F	9849L-NL & F 9949L-NL & F	9857L-NL & F 9957L-NL & F
5	98TP & F 99TP & F	9827TP & F 9927TP & F	9875TP & F 9975TP & F	9847WDCTP & F 9947WDCTP & F	9850WDCTP & F 9950WDCTP & F	9847TP & F 9947TP & F	9848TP & F 9948TP & F	9849TP & F 9949TP & F	9857TP & F 9957TP & F
7	98TP-2 & F 99TP-2 & F		9875TP-2 & F 9975TP-2 & F						
8	98K & F 99K & F	9827K & F 9927K & F	9875K & F 9975K & F	9847WDCK & F 9947WDCK & F	9850WDCK & F 9950WDCK & F	9847K & F 9947K & F	9848K & F 9948K & F	9849K & F 9949K & F	9857K & F 9957K & F
8	98L & F 99L & F	9827L & F 9927L & F	9875L & F 9975L & F	9847WDCL & F 9947WDCL & F	9850WDCL & F 9950WDCL & F	9847L & F 9947L & F	9848L & F 9948L & F	9849L & F 9949L & F	9857L & F 9957L & F
10	98K-2 & F 99K-2 & F		9875K-2 & F 9975K-2 & F						
10	98L-2 & F 99L-2 & F		9875L-2 & F 9975L-2 & F						
11 12		9827TL & F 9927TL & F		9847WDC & F 9947WDC & F	9850WDC & F 9950WDC & F	9847TL & F 9947TL & F	9848 & F 9948& F	9849 & F 9949& F	9857TL & F 9957TL & F
14	98K-8E & F 99K-8E & F	9827K-8E & F 9927K-8E & F	9875K-8E & F 9975K-8E & F	9847WDCK-8E & F 9947WDCK-8E & F	9850WDCK-8E & F 9950WDCK-8E & F	9847K-8E & F 9947K-8E & F	9848K-8E & F 9948K-8E & F	9849K-8E & F 9949K-8E & F	9857K-8E & F 9957K-8E & F
14	98L-8E & F 99L-8E & F	9827L-8E & F 9927L-8E & F	9875L-8E & F 9975L-8E & F	9847WDCL-8E & F 9947WDCL-8E & F	9850WDCL-8E & F 9950WDCL-8E & F	9847L-8E & F 9947L-8E & F	9848L-8E &F 9948L-8E & F	9849L-8E &F 9949L-8E & F	9857L-8E & F 9957L-8E & F
16		9827TL-8E & F 9927TL-8E & F		9847WDC & F 9947WDC & F	9850WDC & F 9950WDC & F	9847TL-8E & F 9947TL-8E & F	9848 & F 9948 & F	9849 & F 9949 & F	9857TL-8E & F 9957TL-8E & F

Dimensions



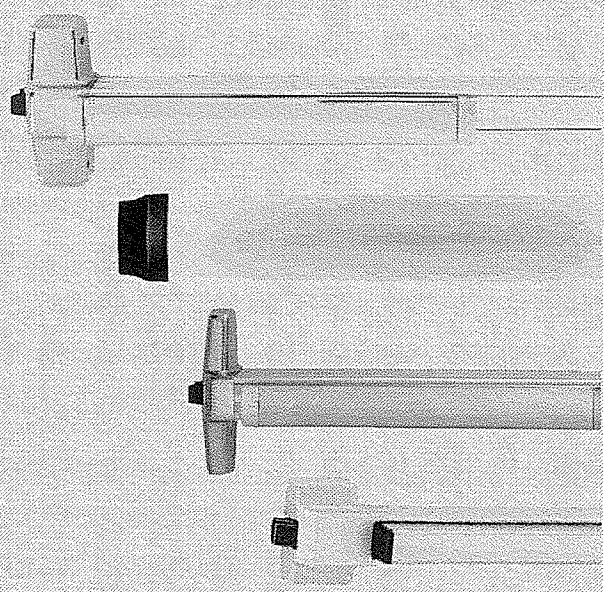
Bid Set - Not For Construction 3/11/2019

ALLEGION

VON DUPRIN

AX exit devices

Featuring the 98/99, 94/95, 33/35A and 22 Series devices



The exit device that requires only 5 lbs. of force to operate

The AX was born out of a need to provide the market with a solution that meets the 2010 ADA Standards for Accessible Design (Chapters 404.2.7 and 309.4) that state the force required to activate operable parts shall be 5 lbs. maximum. The 2013 California Building Code (Chapter 11B-309.4) adopted virtually identical requirements that went into effect January 1st, 2013.

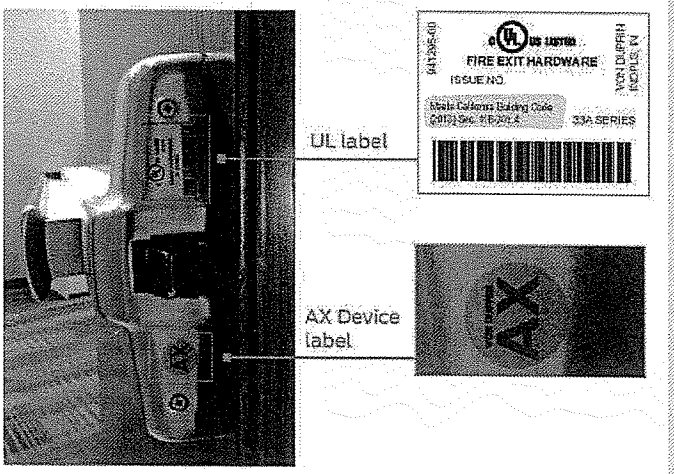
Since pioneering the first exit device in 1908, Von Duprin life safety products have provided unparalleled quality, performance and flexibility for schools, hospitals, stadiums and public buildings. These products come with the support and customer care only offered by Von Duprin. Providing the confidence and peace of mind at critical moments of life safety.

AX device specification requirements

Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, [OPTION for specific compliant products/applications: UL certified to meet maximum 5 pound requirements according to the 2010 ADA Standards for Accessible Design (Chapters 404.2.7 and 309.4) and California Building Code (Chapter 11B-309.4)] and UL listed for Panic Exit or Fire Exit Hardware.

How to identify the Von Duprin AX device

1. Look for the "AX" Prefix in the door schedule and/or specification.
2. In the field, look for the Compliance note on the UL Label and the AX Device Label. Both labels can be found on the center case cover of the exit device as shown below.



Contact Allegion today at 888.925.4359 or ax.allegion.com to learn how the AX device can help you provide accessibility without compromise.

Bid Set - Not For Construction 3/11/2019

AX98/99 Series Specifications

Device types	AX98/99 - Rim AXXP98/99 - Rim AX98/9927 - LBR AX98/9950 WDC - LBL AX98/9949 - LBL & LBL-AFL - Concealed Vertical Cable Less Bottom Latch
Device functions	EO, DT, NL, NLOP, L, LBE, LDT, LNL
Device lengths	3' / 4'
Rating	Panic and Fire
Electric options	**EL** - Electric latch retraction **LX** - Latchbolt monitor switch **LXLC** - Latchbolt monitor switch low current **LXRX** - Latchbolt pushpad monitor **LXRXLC** - Latchbolt pushpad monitor low current **RX** - Pushpad monitor switch **RXLC** - Pushpad monitor switch low current **RX2** - Double pushpad monitor switch **ALK** - Alarm kit **SS** - Signal switch
Mechanical options	**GBK** - Glass bead kit **-2** - Double cylinder **SNB** - Sex bolts **SEC** - Security screws **WP** - Weep holes
Dogging options (Panic only)	**Hex key dogging** = Standard **CD** - Cylinder dogging **DI** - Dogging indicator **LD** - Less dogging **SD** - Special dogging

AX94/95 Series Specifications

Device types	AX94/9547
Device functions	EO, DT, L, LDT, LBE, LNL
Device lengths	3' / 4'
Rating	Panic and Fire
Electric options	**LX** - Latchbolt monitor switch

AX33/35A Series Specifications

Device types	AX33/35A - Rim AX33/3549 - LBL & LBL-AFL - Concealed Vertical Cable Less Bottom Latch
Device functions	EO, DT, NL, NLOP, L, LBE, LDT
Device lengths	3' / 4'
Rating	Panic and Fire (3349 LBL/AFL only)
Electric options	**EL** - Electric latch retraction **LX** - Latchbolt monitor switch **LXLC** - Latchbolt monitor switch low current **LXRX** - Latchbolt pushpad monitor **LXRXLC** - Latchbolt pushpad monitor low current **RX** - Pushpad monitor switch **RXLC** - Pushpad monitor switch low current **RX2** - Double pushpad monitor switch **ALK** - Alarm kit **SS** - Signal switch
Mechanical options	**GBK** - Glass bead kit **SEC** - Security screws **WP** - Weep holes
Dogging options (Panic only)	**Hex key dogging** = Standard **CD** - Cylinder dogging **LD** - Less dogging

AX22 Series Specifications

Device types	AX22 - Rim AX2227 - LBR
Device functions	EO, DT, NL, NLOP, L, LBE
Device lengths	3' / 4'
Rating	Panic and Fire
Electric options	**LX** - Latchbolt monitor switch **RX** - Pushpad monitor switch **RX2** - Double pushpad monitor switch **ALK** - Alarm kit
Mechanical options	**GBK** - Glass bead kit
Dogging options (Panic only)	**Hex key dogging** = Standard **LD** - Less dogging

Ordering information

AX - 98 - - L - F - -2 -US26D - 3' -RHR -996L-06-SNB

1 Prefix	2 Series	3 Device type	4 Function	5 Rating	6 Suffix	7 Finish	8 Door Width	9 Handing	10 Trim	11 Lever Style	12 Accessories

Selections correspond with the numbers above. See price book for specific configuration options.

1 Prefix

AX*	Accessible Device
EL	Electric latch retraction
LX	Latchbolt Monitor Switch
LXLC	Latchbolt Monitor Switch Low Current
LXRX	Latchbolt Pushpad Monitor
LXRXLC	Latchbolt Pushpad Monitor Low Current
RX	Pushpad Monitor Switch
RXLC	Pushpad Monitor Switch Low Current
RX2	Double Pushpad Monitor Switch
SS	Signal Switch

*Must be specified; may select more than one prefix.

2 Series

98	Series 98 - smooth
99	Series 99 - grooved
94	Series 94 - smooth
95	Series 95 - grooved
33A	Series 33A - grooved
35A	Series 35A - smooth
22	Series 22

Contact Allegion today at 888.925.4359 or ax.allegion.com to learn how the AX device can help you provide accessibility without compromise.

3 Device Type

N/A	Rim
27	Surface Vertical Rod
47	Concealed Vertical Rod
49	Concealed Vertical Cable

4 Function

EO	Exit Only
DT	Dummy Trim
NL	Night Latch
NLOP	Night Latch - Optional Pull
L	Lever
LBE	Lever - Blank Escutcheon
LDT	Lever, Rigid - Dummy Trim
LNL	Lever, Rigid - Night Latch

5 Rating

N/A	Panic
F	Fire-rated

6 Suffix

-2	Double Cylinder
LBL/LBR	Less Bottom Latch / Less Bottom Rod
LBL-AFL	Less Bottom Latch with Fire Pin
WH	Weep Holes

7 Finish

See pricebook for finish offering

8 Door Width

3'	Standard Default
4'	

9 Handing

RHR	Right Hand Reverse
LHR	Left Hand Reverse

10 Trim

See pricebook for trim/control offering

11 Lever Style

See pricebook for lever style offering

12 Accessories

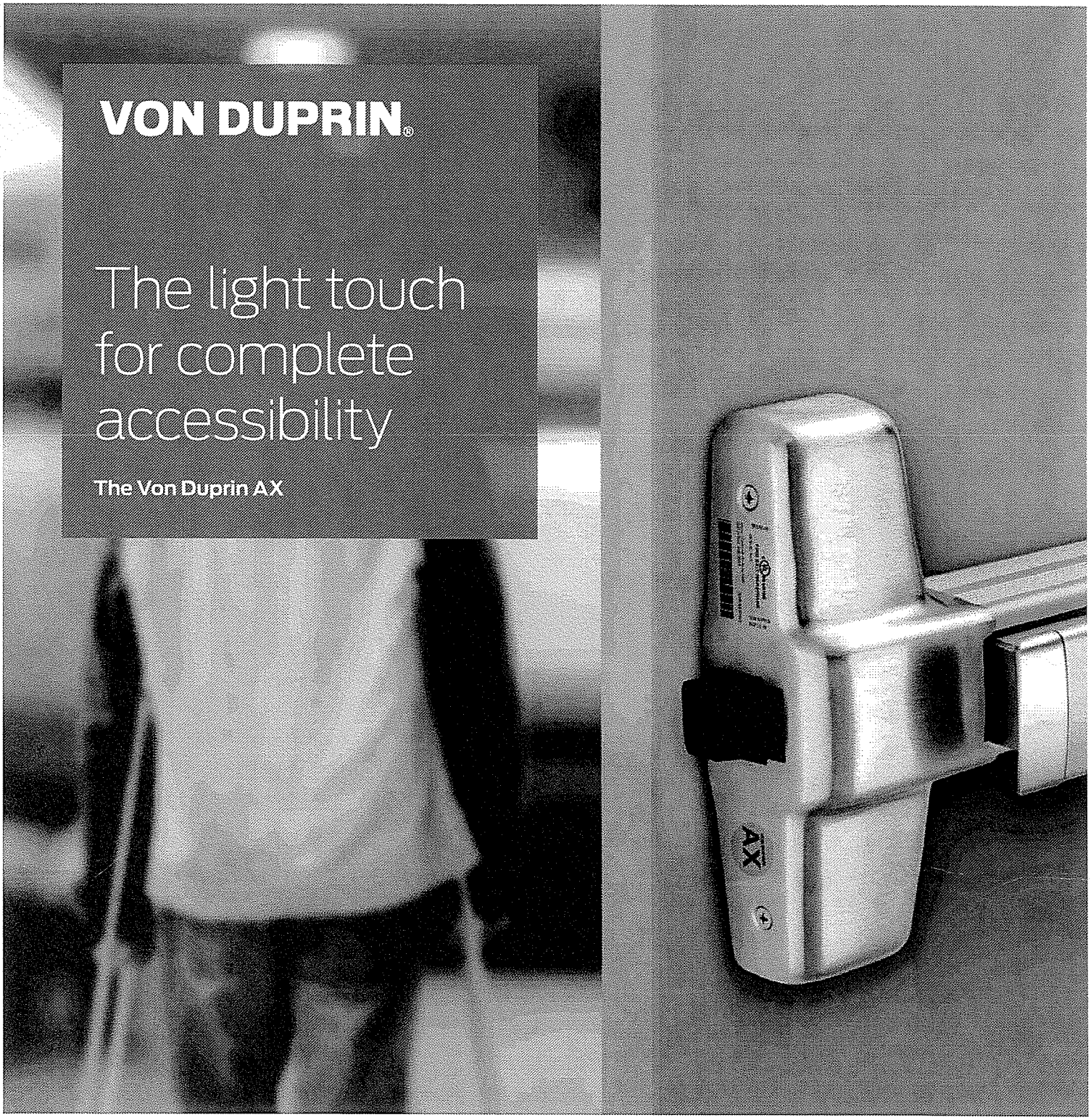
ALK	Alarm Kit
GBK	Glass Bead Kit
SNB	Sex Bolts

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The Von Duprin AX: The exit device which requires only 5 lbs. of force to operate

For decades, architects have turned to Von Duprin for innovative solutions with proven performance. We delivered that once again with the AX, our newest exit device offering. This option provides a complete accessibility solution—without compromising any of the other elements that have made Von Duprin the industry's most trusted exit device manufacturer.

New maximum force code

The AX was born out of a need to provide the market with a solution that meets the 2010 ADA Standards for Accessible Design (Chapters 404.2.7 and 309.4) that state the force reqiured to activate operable parts shall be 5 lbs. maximum. The 2013 California Building Code (Chapter 11B-309.4) adopted virtually identical requirements that went into effect January 1st, 2013.

What this means to you

- New construction projects in the United States require exits to meet 5 lb. maximum operating force.
- An ideal fit for openings that demand maximum accessibility.

UL certification on new California Building Code requirements

The AX is subject to Von Duprin's standard testing to ensure it meets our own rigorous standards for durability, use and functionality. We also received a new UL certification confirming for you—and building inspectors—that an independent third party has verified that the AX is compliant with the 5 lb. maximum operational force requirement. The AX is the first UL-certified exit device to meet the new requirements put in place by ADA Standards and the California Building Code for accessible openings.

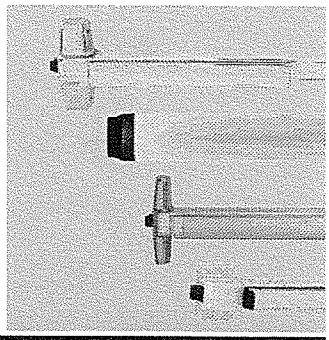
What this means to you

You can be assured that you're specifying a product that's been thoroughly tested to meet the ADA Standard as well as California Building Code's new code requirements. This will help minimize the risk of project delays, liability and lost time and money in having to re-specify an opening.

Accessibility without compromise

On the surface, the AX looks and performs the same as our traditional exit devices. But, through smart engineering and redesign, we've enabled the AX to meet 5 lb. operational force requirements. The chassis now requires less push force to actuate the latch, allowing for accessibility without compromise...the Von Duprin promise.





Von Duprin AX offering

Series	Device Type	Functions
98/99 Fire & panic	AX98/99 AXXP98/99	Exit only/Dummy trim Night latch/Lever Night latch-optional pull Lever-blank escutcheon Lever-rigid-dummy trim Lever-rigid-night latch
	AX98/9927 LBR AX98/9949 LBL AX98/9950WDC LBL	
94/95 Fire & panic	AX94/9547	Exit only/Dummy trim Night latch/Lever Lever-blank escutcheon Lever-rigid-dummy trim Lever-rigid-night latch
33A/35A Fire & panic	AX33/35A	Exit only/Dummy trim Night latch/Lever Night latch-optional pull Lever-blank escutcheon Lever-rigid-dummy trim
	AX33/3549A LBL	
22 Fire & panic	AX22 AX2227 LBR	Exit only/Dummy trim/Night latch Night latch-optional pull Lever/lever-blank escutcheon

About Allegion

Allegion (NYSE: ALLE) creates peace of mind by pioneering safety and security. As a $2 billion provider of security solutions for homes and businesses, Allegion employs more than 8,000 people and sells products in more than 120 countries across the world. Allegion comprises 27 global brands, including strategic brands CISA®, Interflex®, LCN®, Schlage® and Von Duprin®. For more, visit **www.allegion.com.**

aptiQ ■ LCN ■ SCHLAGE ■ STEELCRAFT ■ VON DUPRIN

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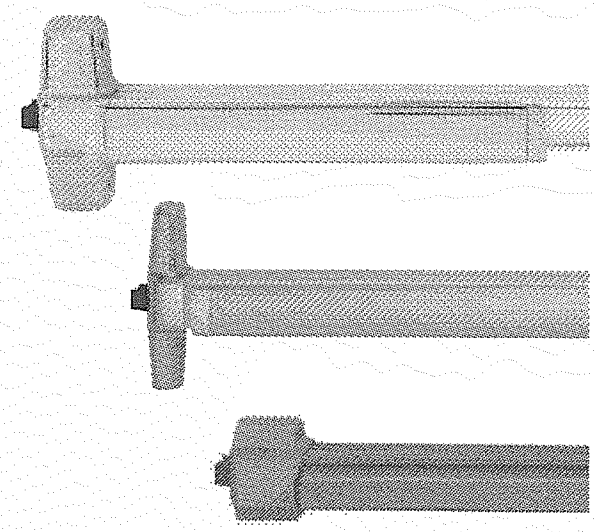
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The first UL certified exit device to meet the new California Building Code Operating Force requirement

VON DUPRIN

AX exit devices

Featuring the 98/99, 33/35A and 22 Series devices



Changes to California Building Code effective January 1, 2014

There were many changes to the new California Building Code that took effect January 1st, 2014. One change impacting operable door hardware, including panic hardware, was the new requirement in chapter 11B for hardware to operate with a maximum of 5 pounds of force operation. "Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2N) maximum"[1].

Von Duprin has the solution certified by UL to "Meet California Building Code (2013) Sec. 11B-309.4"

In order to ensure compliance, Von Duprin and UL tested the products both before and after cycling. **The testing was administered as follows:**

1. Unloaded operating forces must be below 5 lbs. before cycling.
2. Cycle device to 100,000 cycles.
3. Unloaded operating forces must be below 5 lbs. after cycling.
4. Loaded operating forces must be below 50 lbf. with a 250 lb. load on the door after cycle (Safety).

1 - 2013 California Building Code - Section 11B-309.4

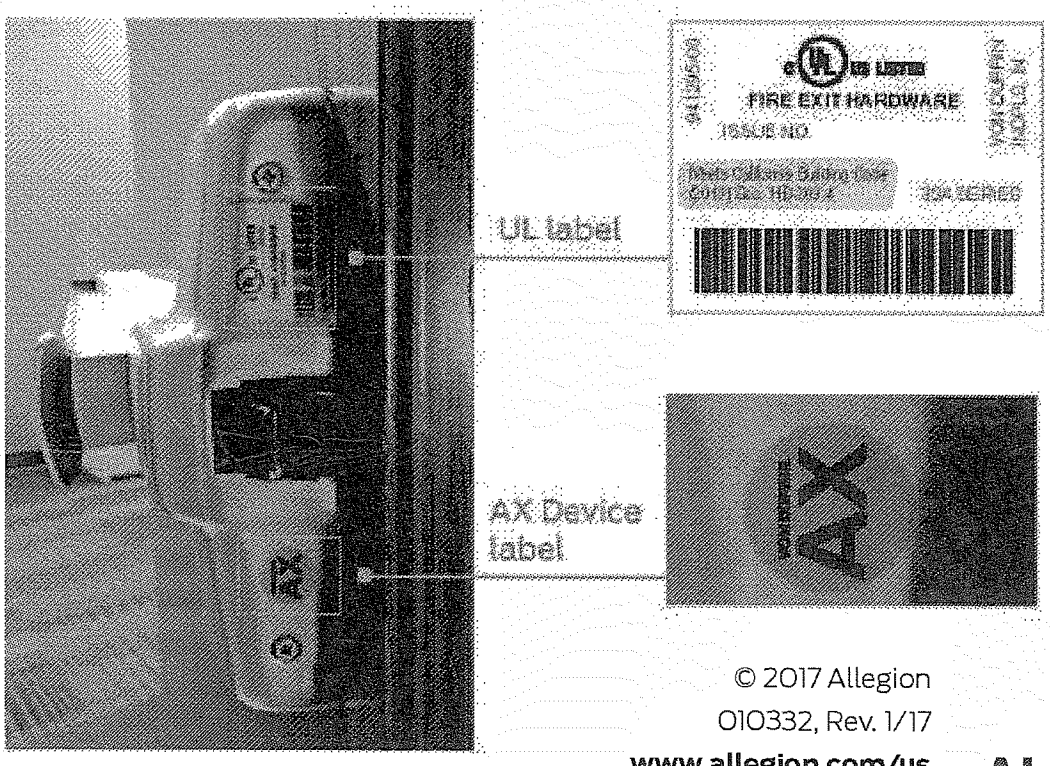
Bid Set - Not For Construction 3/11/2019

Von Duprin AX offering

Series	Device Type	Functions
98/99 Fire & panic	AX98/99 AXXP98/99	Exit only / Dummy trim Night latch / Night latch - Optional Pull Lever / Lever-Blank Escutcheon Lever-Rigid-Dummy trim Lever-Rigid-Night latch
	AX98/9927 LBR AX98/9949 LBL AX98/9950WDC-LBL	
94/95 Fire & panic	94/9547	Exit only / Dummy trim Night latch / Lever / Lever-Blank Escutcheon / Lever-Rigid-Dummy trim Lever-Rigid-Night latch
33/35A Fire & panic	AX33/35A	Exit only / Dummy trim Night latch / Night latch - Optional Pull Lever / Lever-Blank Escutcheon Lever-Rigid-Dummy trim
	AX33/3549A LBL AX33/3349A-F LBL AX33/3549A-F LBL-AFL	
22 Fire & panic	AX22 AX2227-LBR	Exit only / Dummy trim Night latch / Night latch - Optional Pull Lever / Lever-Blank Escutcheon

How to identify the Von Duprin AX device

1. Look for the "AX" Prefix in the door schedule and/or specification.
2. In the field, look for the California Compliance note on the UL Label and the AX Device Label. Both labels can be found on the center case cover of the exit device as shown below.



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Sex bolts

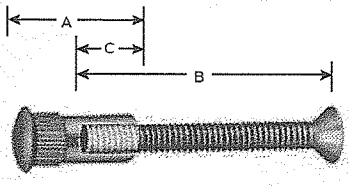
Sex Bolts when ordered with devices may be furnished with screw lengths different than shown in Column B. On page 7, Column B indicates popular sizes. Sex Bolts ordered separately are not furnished with screws. If screws are required refer to chart on page 7 and order screws by description as a separate item. Other screw lengths may be used based on minimum and maximum allowable thread engagement, shown in column "C." Quantity required — refer to device section, quantities differ depending on outside trim.

425 sex bolts are required for 22/88/98/99 series fire rated devices when used on wood door applications. When wood doors are specified for these devices, sex bolts will be added to the device application unless SLM blocking package is specified.

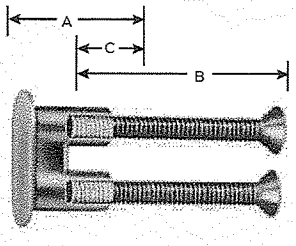
825 sex bolts are required with 98-F/99-F rim devices on wood door applications using EO, NL, TP, K and L outside trims. Two 825 sex bolts will be added to the device application unless SLM blocking package is specified.

To order, specify

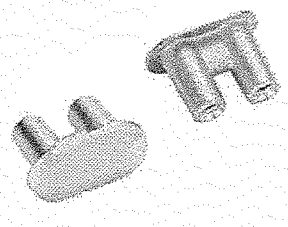
1. Model number
2. Quantity (2 per package)
3. Finish
4. Door thickness other than 1¾" (44mm).



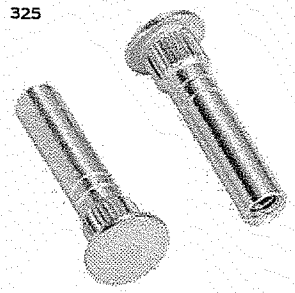
325,425,625A & 625B



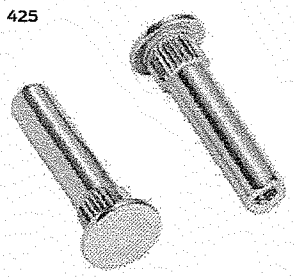
525



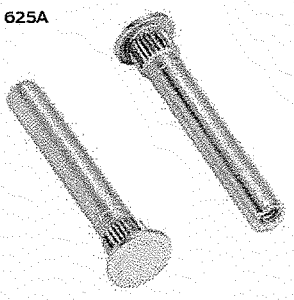
325



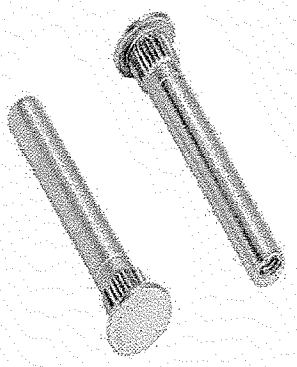
425



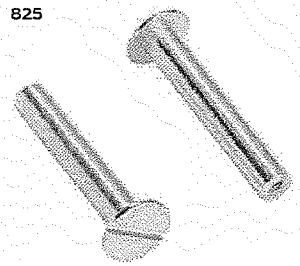
625A



625B



825



Refer to page 7 for A, B and C lengths

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Vertical rods

Rim, mortise and concealed vertical rod

Device type	Door thickness	Center case				Hinge case			
		Sex Bolt			C Thread engagement min. - max.	Sex bolt			C Thread engagement min. – max.
		No.	A	B Screw		No.	A	B Screw	
22	1¾" (44mm)	425	1 9/16"	10-24 x 1" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x ¾" PPHMS	9/32" – 5/8"
	2¼" (57mm)	425	1 9/16"	10-24 x 1 1/2" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"
33A, 3347A, 3347A-F 35A, 3547A, 3547A-F	1 ¾" (44mm)	325	1 9/32"	1/4-20 x 1" FPHMS	3/8" – 11/16"	425	1 9/16"	10-24 x ¾" PPHMS	9/32" – 5/8"
	2¼" (57mm)	325	1 9/32"	1/4-20 x 1 1/2" FPHMS	3/8" – 11/16"	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"
55	1¾" (44mm)	625A	2 5/16"	12-24 x ¾" OPHMS	11/32" – 13/16"	625A	2 5/16"	12-24 x ¾" OPHMS	9/32" – 13/16"
	2¼" (57mm)	625B	2 13/16"	12-24 x ¾" OPHMS	1/2" – 1"	625B	2 13/16"	12-24 x 1 1/4" OPHMS	1/2" – 1"
5575, 5575-F 5547, 5547F	1¾" (44mm)	—	—	—	—	625A	2 5/16"	12-24 x ¾" OPHMS	11/32" – 13/16"
	2¼" (57mm)	—	—	—	—	625B	2 13/16"	12-24 x 1 1/4" OPHMS	1/2" – 1"
88, 88-F, 8875, 8875-F	1¾" (44mm)	425	1 9/16"	10-24 x 1 1/2" OPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/2" OPHMS	9/32" – 5/8"
	2¼" (57mm)	425	1 9/16"	10-24 x 2" OPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 2" OPHMS	9/32" – 5/8"
8847-F	1¾" (44mm)	—	—	—	—	425	1 9/16"	10-24 x 1 1/2" OPHMS	9/32" – 5/8"
	2¼" (57mm)	—	—	—	—	425	1 9/16"	10-24 x 2" OPHMS	9/32" – 5/8"
98, 9875, 9875-F, 9847, 9847-F, 99, 9975, 9975-F, 9947, 9947-F	1¾" (44mm)	425	1 9/16"	10-24 x 1" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1" PPHMS	9/32" – 5/8"
	2¼" (57mm)	425	1 9/16"	10-24 x 1 1/2" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/2" PPHMS	9/32" – 5/8"
98-F, 99-F*	1¾" (44mm)	425 825A*	1 9/16" 1 13/16"	10-24 x 1" PPHMS 10-24 x ¾" PPHMS	9/32" – 5/8" 9/32" – 5/8"	425	1 9/16"	10-24 x ¾" PPHMS	9/32" – 5/8"
	2¼" (57mm)	425 825B*	1 9/16" 1 13/16"	10-24 x 1 1/2" PPHMS 10-24 x ¾" PPHMS	9/32" – 5/8" 9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"

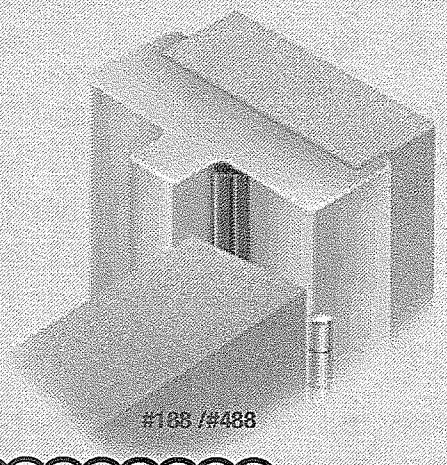
Surface vertical rod

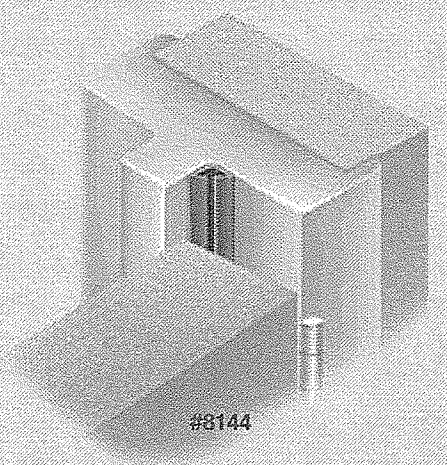
Device type	Door thickness	Center case				Hinge case				Top & bottom latch case			
		Sex bolt			C Thread engagement min. - max.	Sex bolt			C Thread engagement min. – max.	Sex bolt			C Thread engagement min. – max.
		No.	A	B Screw		No.	A	B Screw		No.	A	B Screw	
2227, 2227-F	1¾" (44mm)	425	1 9/16"	10-24 x 1" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x ¾" PPHMS	9/32" – 5/8"	325	1 9/32"	1/4-20 x ¾" UFPHMS	3/8" – 11/16"
	2¼" (57mm)	425	1 9/16"	10-24 x 1 1/2" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"	325	1 9/32"	1/4-20 x 1 1/4" UFPHMS	3/8" – 5/8"
3327A 3527A	1¾" (44mm)	325	1 9/32"	1/4-20 x 1" FPHMS	3/8" – 11/16"	425	1 9/16"	10-24 x ¾" PPHMS	9/32" – 5/8"	325	1 9/32"	1/4-20 x ¾" UFPHMS	3/8" – 11/16"
	2¼" (57mm)	325	1 9/32"	1/4-20 x 1 1/2" FPHMS	3/8" – 11/16"	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"	325	1 9/32"	1/4-20 x 1 1/4" UFPHMS	3/8" – 11/16"
8827, 8827-F	1¾" (44mm)	425	1 9/16"	10-24 x 1 1/2" OPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/2" OPHMS	9/32" – 5/8"	425	1 9/32"	10-24 x ¾" PPHMS	9/32" – 5/8"
	2¼" (57mm)	425	1 9/16"	10-24 x 2" OPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 2" OPHMS	9/32" – 5/8"	425	1 9/32"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"
9827, 9827-F 9857 9857-F	1¾" (44mm)	425	1 9/16"	10-24 x 1" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x ¾" PPHMS	9/32" – 5/8"	325	1 9/32"	1/4-20 x ¾" UFPHMS	3/8" – 11/16"
9927, 9927-F 9897 9957-F	2¼" (57mm)	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"	425	1 9/16"	10-24 x 1 1/4" PPHMS	9/32" – 5/8"	325	1 9/32"	1/4-20 x 1 1/4" UFPHMS	3/8" – 5/8"

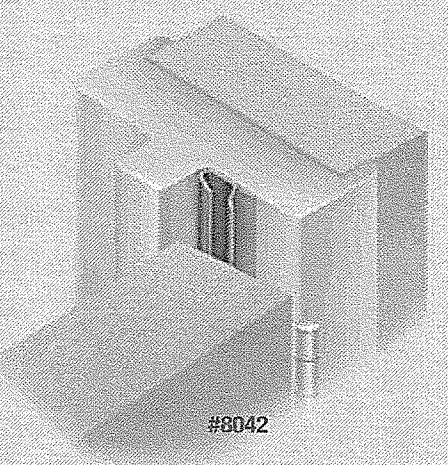
FPHMS — Flat Phillips head machine screw
OPHMS — Oval Phillips head machine screw
PPHMS — Pan Phillips head machine screw
UFPHMS — Undercut flat Phillips head machine screw)

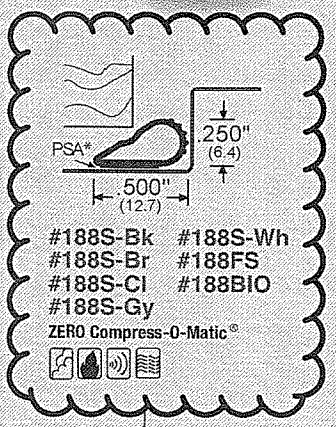
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Note:
N = Neoprene
S-Bk = Silicone, Black
S-Wh = Silicone, White
S-Br = Silicone, Brown
S-Cl = Silicone, Clear
S-Gy = Silicone, Grey
FS= Intumef™ Rubber
Y-Bk = Polyvinyl, Black
BIO = Antibacterial Gasketing, White
PSA* is equipped with 3M self-adhesive tape
All products are available with ZAG feature (Anti-Ligature)

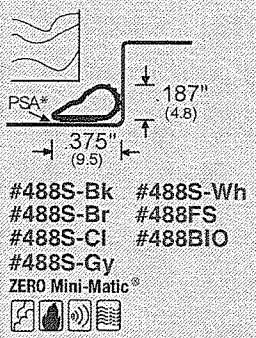

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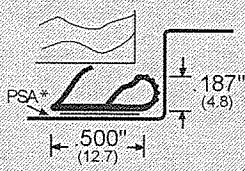

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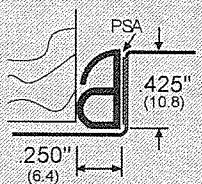
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#188S-Br #188FS
#188S-Cl #188BIO
#188S-Gy
ZERO Compress-O-Matic®



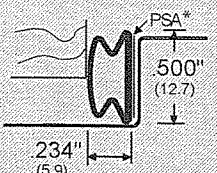
#488S-Bk #488S-Wh
#488S-Br #488FS
#488S-Cl #488BIO
#488S-Gy
ZERO Mini-Matic®



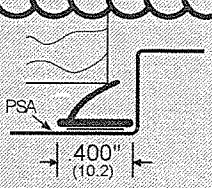
#8145S-Bk
ZERO Compress-O-Matic®



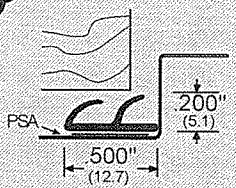
#824N



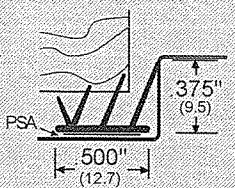
#8216S-Bk



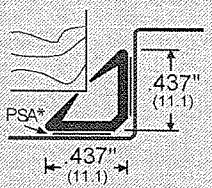
#117S-Bk



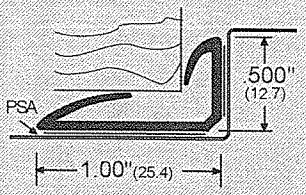
#8042S-Bk



#8150S-Bk

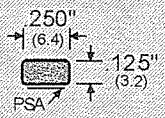


#8144S-Bk
#8144S-Wh
#8144 FS

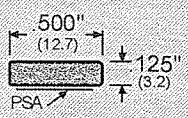


#8160Y-Bk

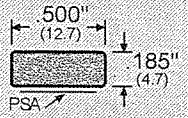
Closed Cell Sponge Neoprene



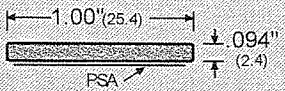
#8172N



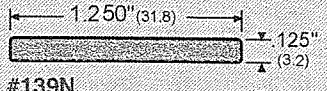
#8770N



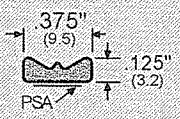
#312N



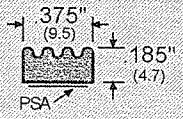
#8780N



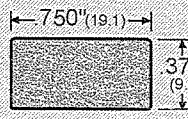
#139N



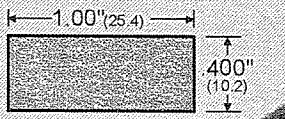
#826N



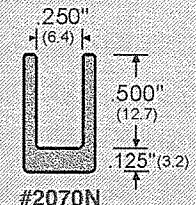
#926N



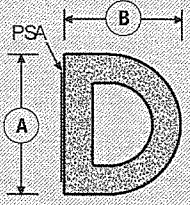
#318N



#3708N



#2070N



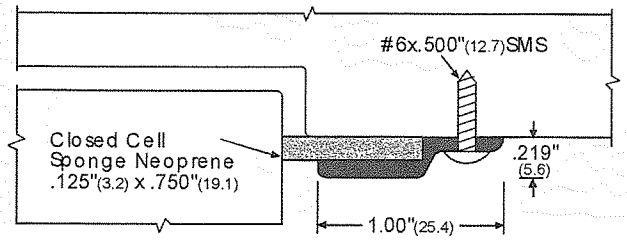
Part#	A	B
#810	.625" (15.9)	.625" (15.9)
#811	.750" (19.1)	.625" (15.9)
#812	1.00" (25.4)	.500" (12.7)
#813	1.250" (31.8)	.625" (15.9)



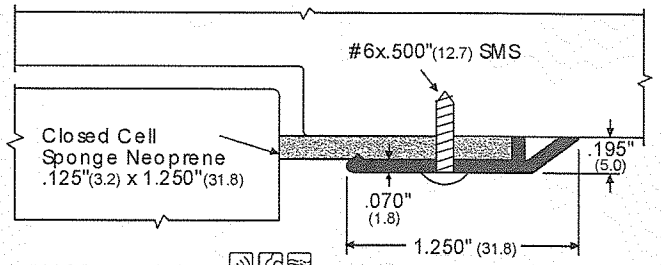
Door Seals

Bid Set - Not For Construction 3/11/2019

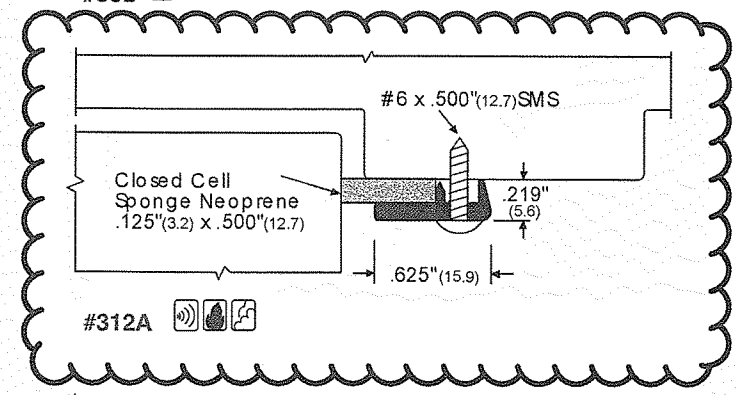
Note: A = Aluminum
B = Bronze
FS = Intumet™
PVC = Polyvinyl clear
AA = Clear Anodized
D = Dark Bronze Anodized
G = Gold Anodized



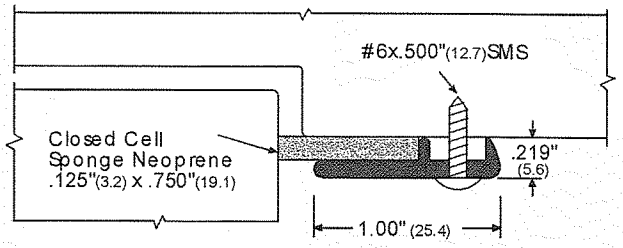
#50A
#50D



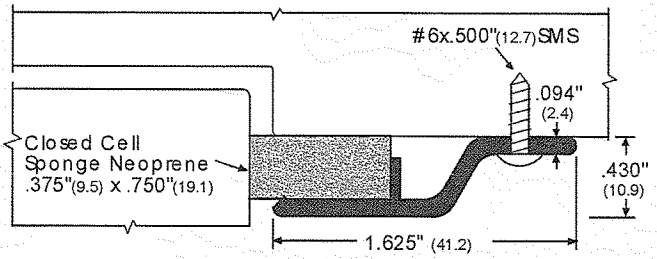
#139A #139D



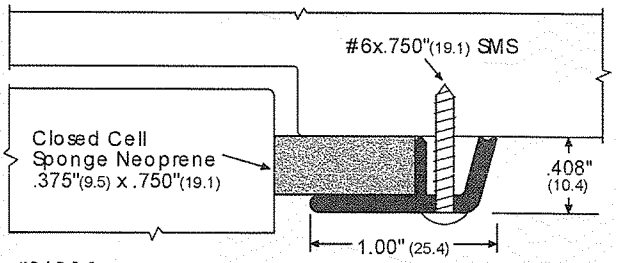
#312A



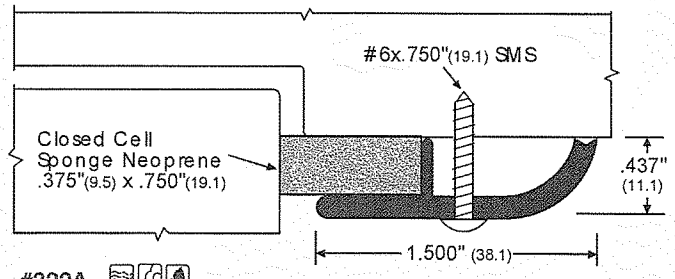
#314AA #314D
#314B #314G
#314PVC



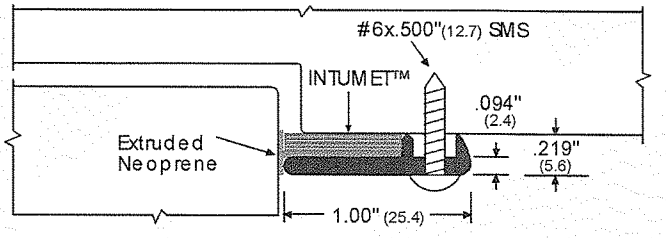
#140A



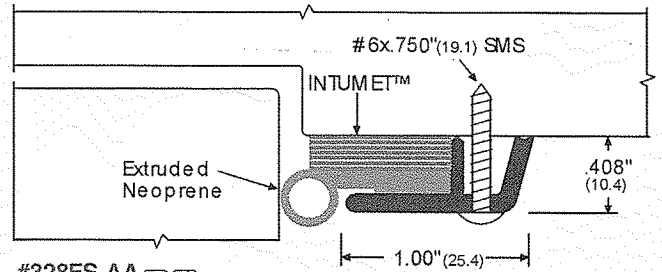
#318AA
#318D



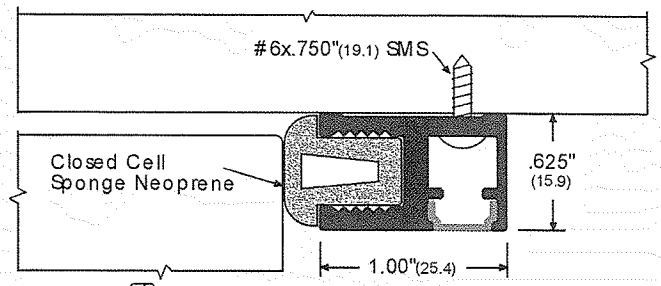
#322A



#302FS AA #302FS D
#302FS B #302FS G



#328FS AA
#328FS D
ZERO Compress-O-Matic®

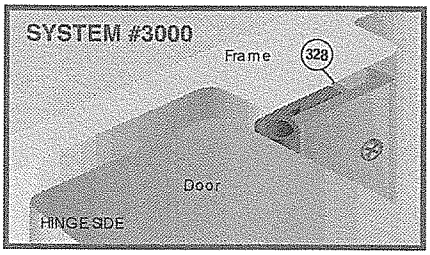


#8881AA
ZERO Compress-O-Matic®

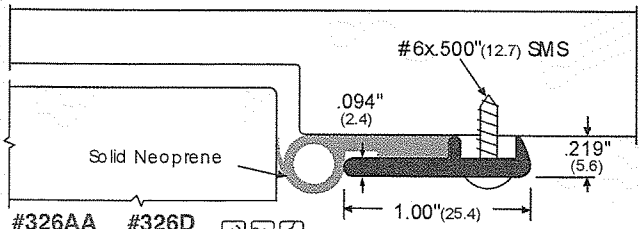
Head & Jamb

Bid Set - Not For Construction 3/11/2019

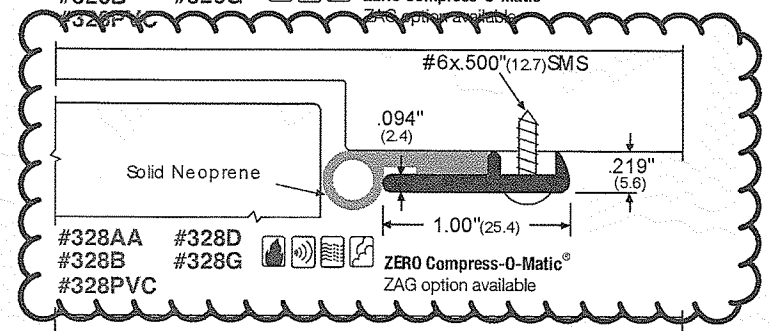
Note: A = Aluminum AA = Clear Anodized
B = Bronze D = Dark Bronze Anodized
G = Gold Anodized PVC = Polyvinyl clear
ZAG = Ligature-Resistant gasketing



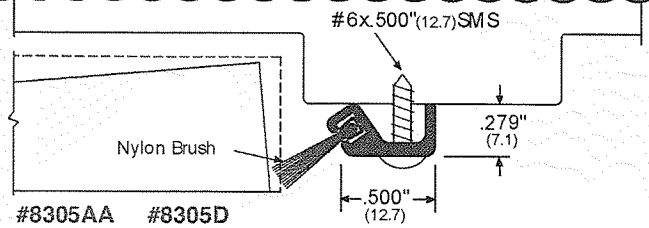
System #3000 consists of:
#328 (hinge side)
#326 (head & lock sides)



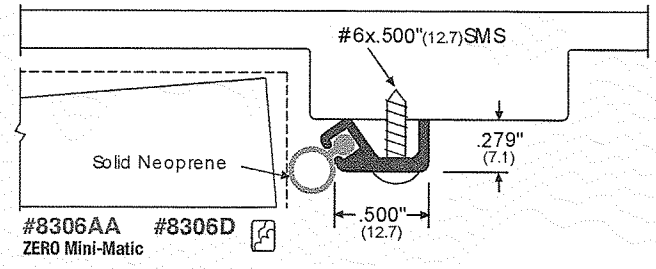
#326AA #326D
#326B #326G
#326PVC
ZERO Compress-O-Matic®
ZAG option available



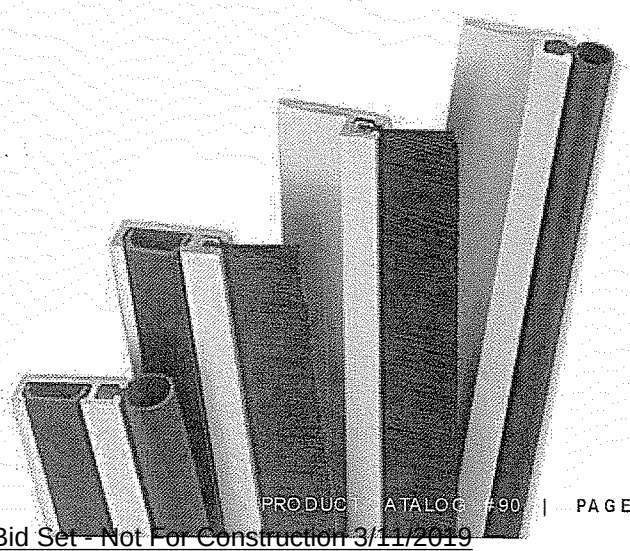
#328AA #328D
#328B #328G
#328PVC
ZERO Compress-O-Matic®
ZAG option available

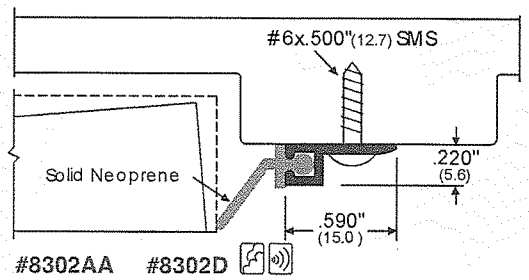


#8305AA #8305D

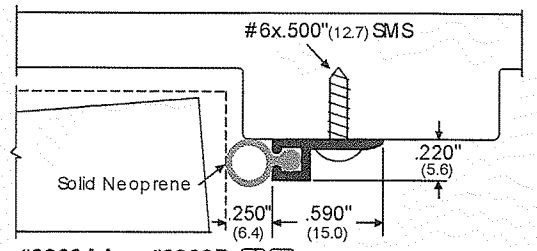


#8306AA #8306D
ZERO Mini-Matic

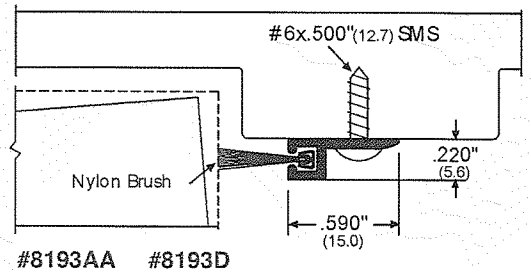




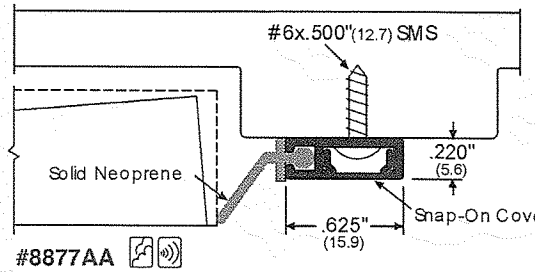
#8302AA #8302D



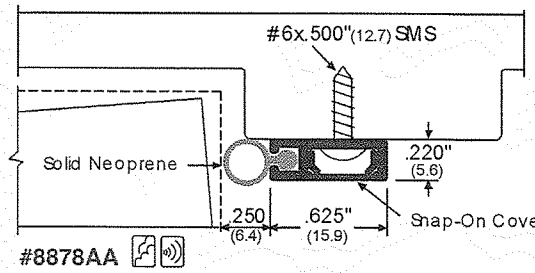
#8303AA #8303D
ZERO Mini-Matic



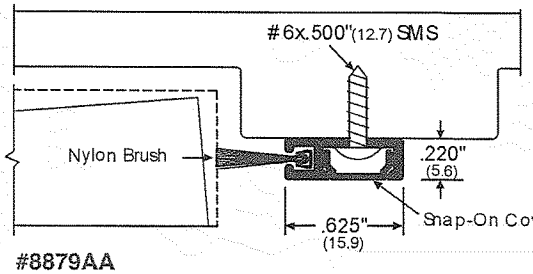
#8193AA #8193D



#8877AA

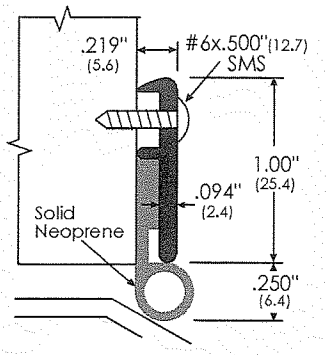


#8878AA
ZERO Mini-Matic



#8879AA

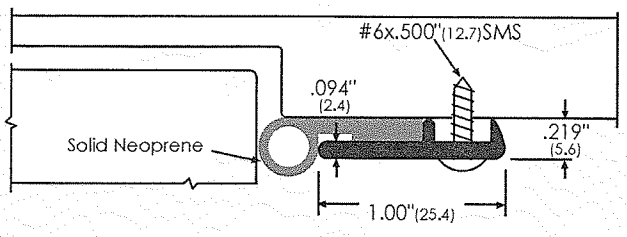
Bid Set - Not For Construction 3/11/2019



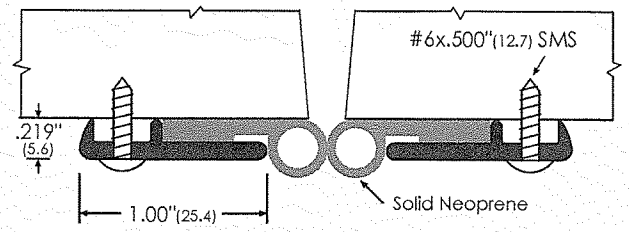
Door Sweep
- Surface Mounted
- Solid Neoprene

FIRE AND SMOKE RATINGS

- UL listed
- ITS Warnock Hersey listed
- 10B Classified up to 90 minutes
- 10C Classified up to 90 minutes
- Category H Classified under UL 1784, listed up to 180 minutes



Head and Jamb Protection
- Stop Applied
- Solid Neoprene



Meeting Stile, Both Doors Active
- Surface Mounted
- Solid Neoprene

Legend:
AA = Clear Anodized
B = Bronze
D = Dark Bronze Anodized
G = Gold Anodized

^NSI/BHMA

Head & Jamb	#328AA / 328D / 328G	R3B164
	#328B	R1B164
Door Sweep	#328AA / 328D / 328G	R3B434
	#328B	R1B434
Meeting Stiles	#328AA / 328D / 328G	R3B734
	#328B	R1B734

ZERO INTERNATIONAL
415 Concord Avenue
Bronx, NY 10455
tel: 718.585.3230
fax: 718.292.2243
email: zero@zerointernational.com
web site: www.zerointernational.com

Part No: 328

Notes:

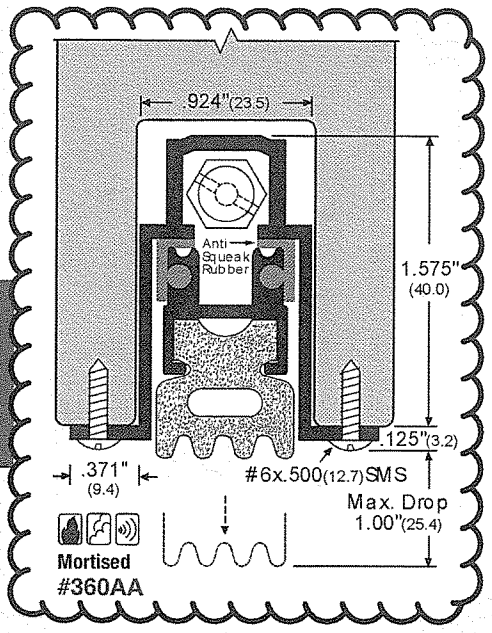
Part Description:
See above for options

Also available in ZAG feature (Anti-Ligature)

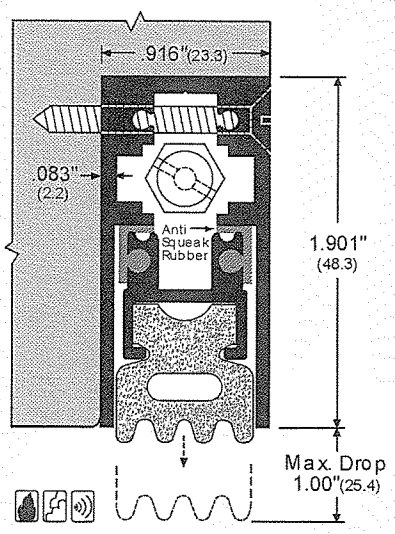
Provided By:	Customer Name:	Job No:	Date:

ZERO INTERNATIONAL

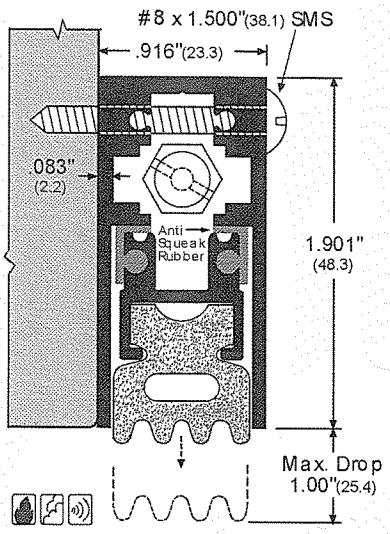
Note: A = Aluminum D = Dark Bronze Anodized
AA = Clear Anodized G = Gold Anodized



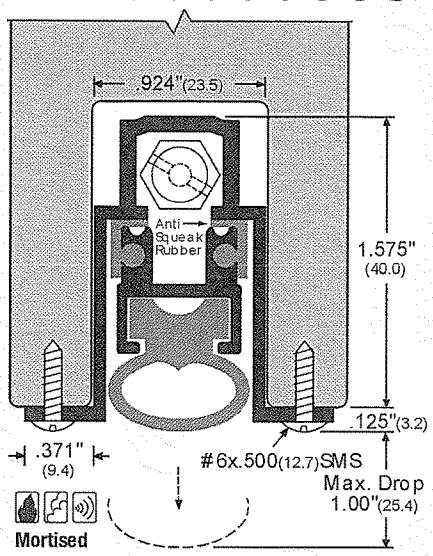
Mortised
#360AA



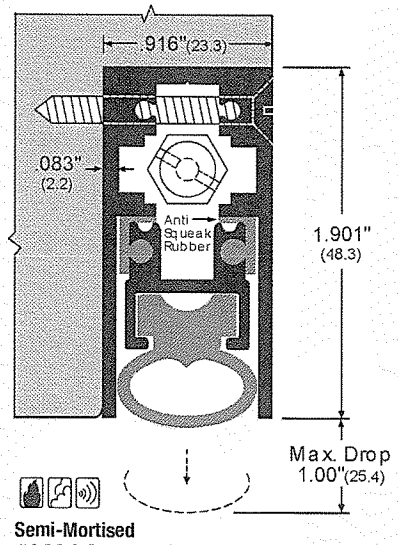
Semi-Mortised
#362AA #362D #362G



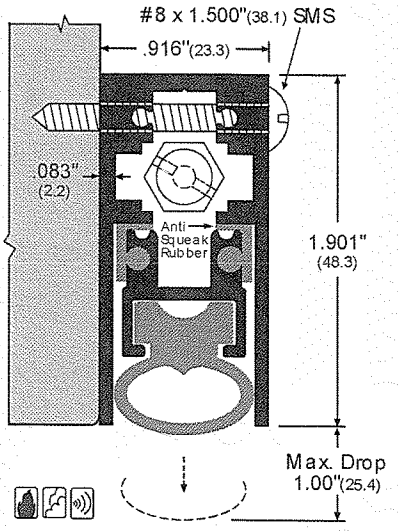
Surface-Mounted
#361AA #361D #361G



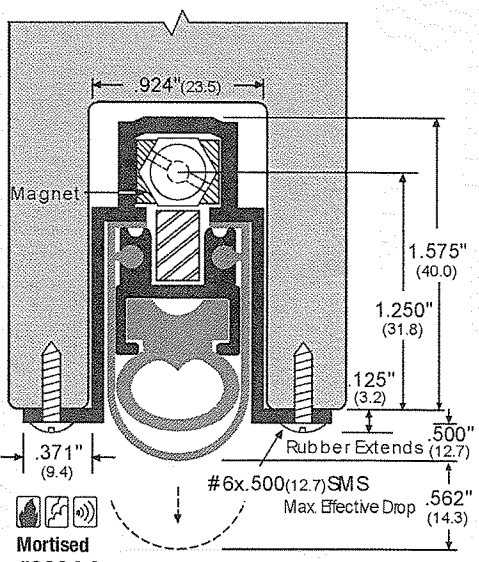
Mortised
#364AA



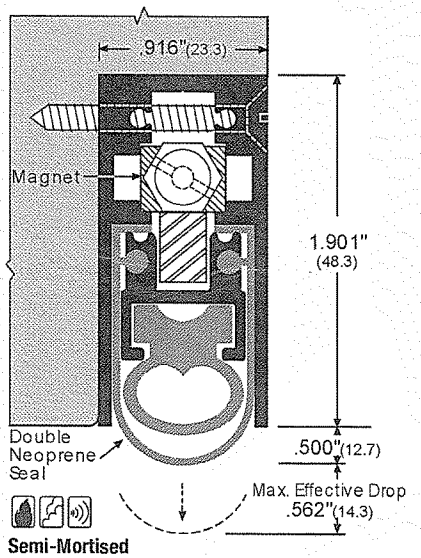
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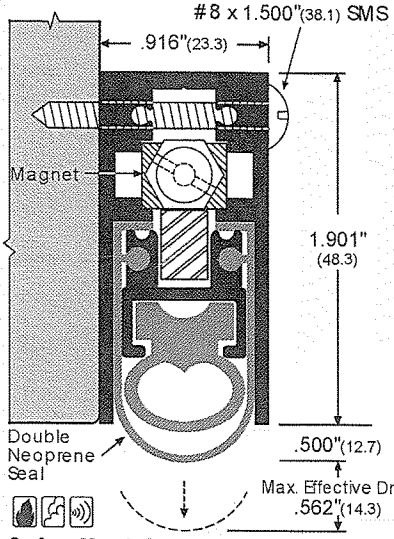
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#365AA #365D #365G



Mortised
#369AA



Semi-Mortised
#368AA #368D #368G



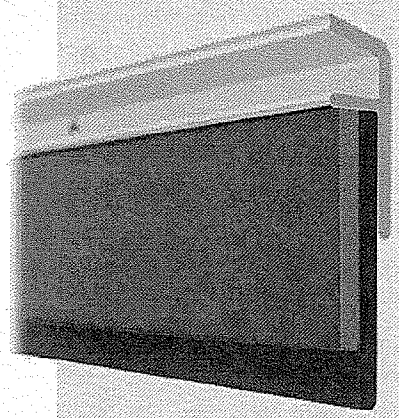
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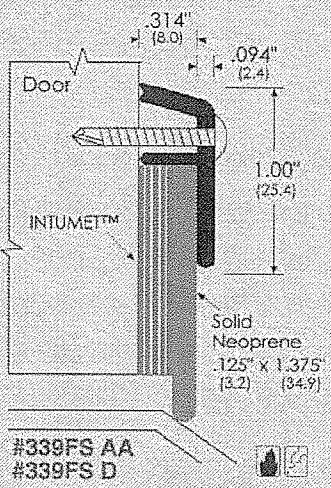
Bid Set - Not For Construction 3/11/2019

Restore Lost Fire Rating

Maximum 0.5" (12.7mm) clearances allowed at the bottom of fire-rated doors do not leave much room for error. Fire ratings lost when installation or alignment problems cause larger clearances can be restored using these INTUMET™ solutions, without the costs of structural changes or door replacement.

20-Minute Rating

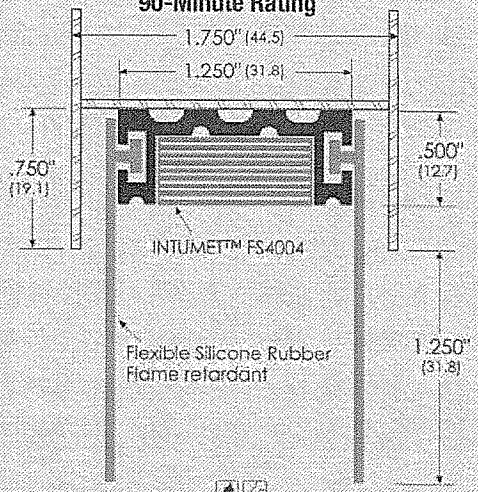




#339FS AA
#339FS D

Restore for 20 minute fire-rated wood doors and metal doors with excessive undercut up to 1.250". ITS-listed to positive pressure UBC 7-2 1997.

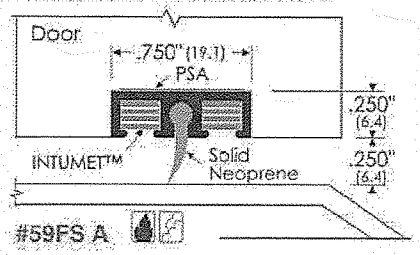
90-Minute Rating



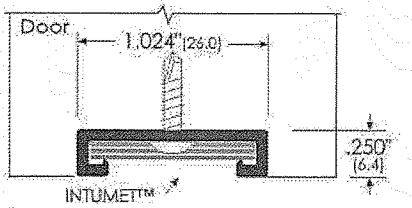
#521FS A

Restore for 90 minute fire-rated metal doors with excessive undercut up to 1.250". Tested under UL 10C, UBC 43-2, NFPA 252 standards by an independent laboratory.

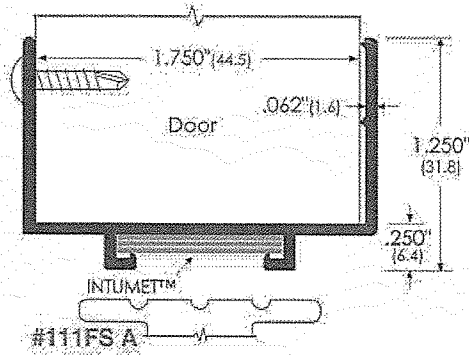
Other products with Intumescent



#59FS A



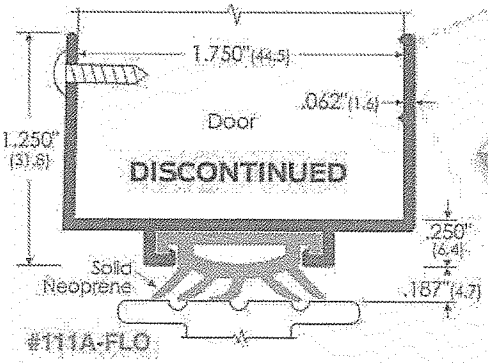
#253FS A



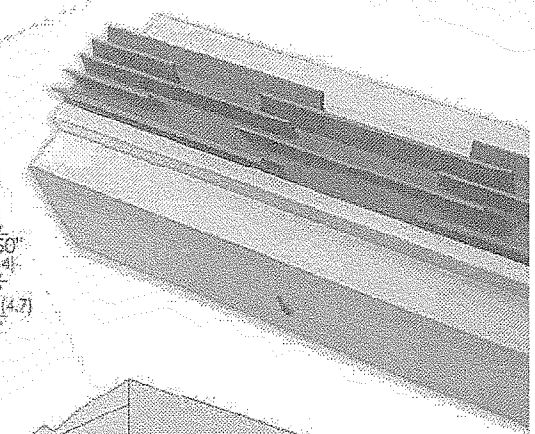
#111FS A

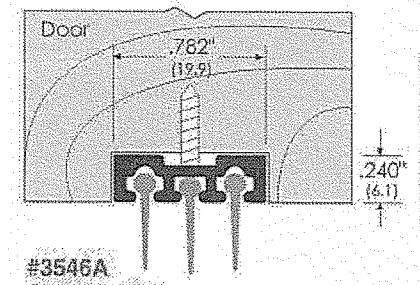
FLO Option Door Sweeps

Door sweeps with FLO Option are designed with neoprene or brush seals that are notched and overlapped. This feature allows air to flow while blocking light.

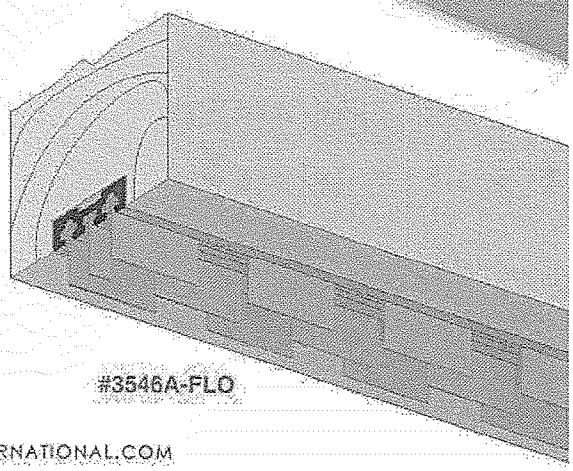


#111A-FLO





#3546A
#3546A-FLO
#3544A **Brush insert** (not shown)



#3546A-FLO

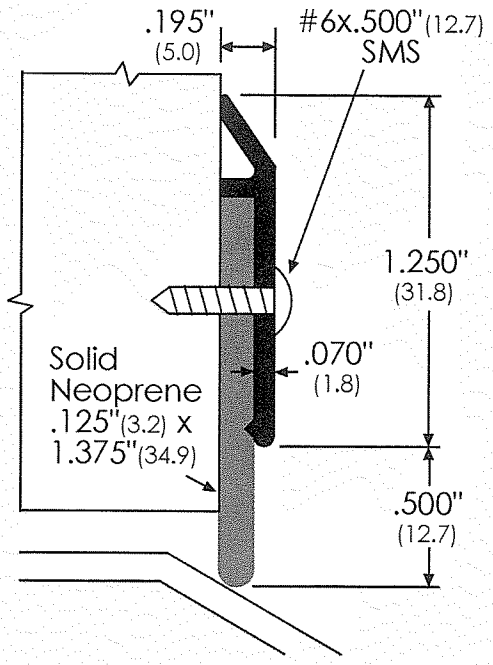
Bid Set - Not For Construction 3/11/2019

FIRE PERFORMANCE

This seal is non-flammable

SMOKE PERFORMANCE

The rubber seal in this gasket provides protection from smoke infiltration in accordance with provisions of NFPA 101 Life Safety Code and NFPA 80 Standard for Fire Doors and Other Opening Protectives



Legend:
A = Aluminum
D = Dark Bronze Anodized

ANSI/BHMA

#39A / 39D	R3B434

ZERO INTERNATIONAL

415 Concord Avenue
Bronx, NY 10455
tel: 718.585.3230
fax: 718.292.2243
email: zero@zerointernational.com
web site: www.zerointernational.com

Part No: 39

Notes:

Part Description:

Door Sweep

- Surface Mounted
Aluminum with Neoprene

Provided By:	Customer Name:	Job No:	Date:

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass and glazing for hollow metal work interior windows and doors.

B. Factory glazing of aluminum windows.

C. Mirror glass.

1.2 SECTION EXCLUDES

A. Fire Rated Glass

1.3 REFERENCES

A. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. ASTM C920 - Elastomeric Joint Sealants.

C. ASTM C1036 - Flat Glass.

D. ASTM C1048 - Heat-Treated Flat Glass.

E. ASTM C1172 - Specification for Laminated Architectural Flat Glass.

F. GANA - Glazing Manual and Sealant Manual.

G. UL - Underwriters' Laboratories, Inc., Building Materials Directory.

1.4 QUALITY ASSURANCE

A. Conform to Glass Association of North America (GANA) Glazing Manual and Sealant Manual for glazing installation methods.

1.5 SUBMITTALS

A. Product Data: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements for glass. Provide data on glazing sealant. Identify colors available.

B. Submit two 12-inch-square Samples, illustrating each glass coloration.

C. Submit 12-inch long bead of glazing sealant in color selected.

D. Submit sealed glass unit manufacturer's certificate indicating units meet or exceed specified requirements.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Deliver, store and protect products under provisions of Section 01 87 00.

1.7 WARRANTY

A. Provide manufacturer’s warranty against defects in material, including loss of hermetic seal insulating units, for a period of 5 years after date of Substantial Completion.

B. Include coverage for reflective coating on mirrors and replacement of same.

C. Include coverage for delamination of laminated glass and replacement of same.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulating Glass:

1. Viracon, Inc
2. PPG Industries, Inc.
3. Oldcastle Glass.

B. Tempered Glass:

1. Guardian Industries Corp.
2. PPG Industries, Inc.
3. HGP and Affiliates Inc.
4. AFG Industries, Inc.
5. Spectrum Glass Products, Inc.
6. Oldcastle Glass.
7. Viracon, Inc.

C. Mirror Glass:

1. Laurence Co., Inc.

2. Ford Glass Division.

3. PPG Industries, Inc.

4. LOF Glass, Inc.

5. Avalon Mirror.

2.2 GLASS MATERIALS, GENERAL

A. Primary Glass Standard: Comply with ASTM C1036 requirements, including reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Tempered Glass Standard: Comply with ASTM C1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Visual Light Transmission and Heat Gain: Conform to requirements indicated.

D. Sizes: Fabricate glass to sizes required for glazing openings, with edge clearances and tolerances complying with recommendations of glass manufacturer and GANA.

E. Provide thicknesses indicated or, if not indicated, as recommended by glass manufacturer for application indicated.

F. Minimum Glazing Requirements set forth by CBC Table 2403.2.1

2.3 PRIMARY GLASS PRODUCTS

A. Clear Float Glass: ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select). Low E coating on No. 2 surface of exterior glass.

B. Mirror Glass: ASTM C1036, Type I Transparent Glass, Flat; Class 1, Clear; q1 mirror select; 1/4 inch thick with pressure-sensitive adhesive coated scrim-impregnated film tape safety backing.

2.4 INSULATED GLASS PRODUCTS (NEW WINDOWS)

A. Clear tempered glass at operable lites and adjacent to exterior doors: double pane units with both inner and outer panes of clear tempered glass as specified above.

B. Clear float glass at fixed windows

C. Glass thicknes: ¼”

D. Unit thickness: 1 inch thick:

1. Exterior: ¼” (6mm) Clear VE1-45
2. Center: ½” (13.2mm) Airspace
3. RoomSide: ¼” (6mm) Clear Low-E #4

E. Identification; Each unit of tempered shall be permanently identified by manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed.

1. Clear double pane insulating glass operable lite: SHGC of .30.
2. Clear double pane insulating glass fixed lite: SHGC of .30
3. Clear double pane insulating glass operable lite: U-Factor of .30 (.26 summer).
4. Clear double pane insulating glass fixed lite: U-Factor of .30 (.26 summer)

2.5 INSULATED GLASS PRODUCTS (GLASS REPLACEMENT)

A. Not Used

2.6 TEMPERED GLASS PRODUCTS

A. Manufacturing Process: Horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed.

B. Clear Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select); conforming to ANSI Z97.1.

C. Clear Tempered Float Glass - Low E: ASTM C1048, Kind FT (fully tempered), Condition C (coated) with low E coating on No. 2 surface, Type 1 (transparent glass, flat) Class 1 (clear), Quality q3 (glazing select); conforming to ANSI Z97.1.

2.7 LAMINATED GLASS PRODUCTS

A. Laminated Glass: Two panes of float glass of equal thickness, ASTM C1172, kind LHS (heat-strengthened), laminated with 0.060 inch thick plastic interlayer; conforming to ANSI Z97.1. Unit shall have the following characteristics:

1. Overall Laminated Glass Thickness: Approximately 5/16 inch.

2. Visual Light Transmission (VLT): The VLT of the entire laminated assembly shall be equal to or better than 75%.

3. Solar Heat Gain Coefficient: The SHGC of the entire laminated assembly shall equal to or less than 0.60.

B. Obscure Laminated Glass:

1. Glass: Class 1 clear for both panes. Low E coating on Number 2 surface.

2. Glass Thickness (each pane): 1/8 inch.

3. Color of Plastic Interlayer: Obscure (white).

C. Clear Laminated Glass:

1. Glass: Class 1 clear for both panes. Low E coating number 2 surface.

2. Glass Thickness (Each Pane): 1/8/ inch.

3. Color of Plastic Interlayer: Clear.

D. Plastic Interlayer: Polyvinyl Butyral as manufactured by:

1. “Saflex”; Monsanto Co.

2. “Butacite”; E.S. DuPont DeNemours & Co., Inc.

2.8 GLAZING SEALANTS AND PREFORMED GLAZING TABS

A. General: Comply with ASTM C920, and sealant and glass manufacturers recommendations for suitability and compatibility.

B. One-Part Butyl Glazing Sealant:

1. “Chem-Calk 300”; Bostik Construction Products Div.

2. “Norseal Butyl”; Norton Performance Products.

3. “BC 158”; Pecora Corp.

4. “757 Butyl Sealant”; Protective Treatments, Inc.

C. One-Part Acid-Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25:

1. “Chem-Calk 1200”; Bostik Construction Products Div.

2. “Dow Corning 999”; Dow Corning Corp.

3. “SCS 1200”; General Electric Corp.

4. “863”; Pecora Corp.

5. “Rhodorsil 3B”; Rhone-Poulenc Inc.

6. “Omniglaze”; Sonneborn Building Products Div.; Rexnord Chemical Products Inc.

7. “Proglaze”; Tremco.

D. Preformed Butyl-Polyisobutylene Glazing Tape With Spacer Rod:

1. “Chem-Tape 60”; Bostik Construction Products Div.

2. “Shim-Seal”; Pecora Corp.

3. “PTTI 303 Shim Tape”; Protective Treatments, Inc.

4. “Pre-shimmed Tremco 440 Tape”; Tremco Inc.

2.9 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene; EPDM or silicone blocks, 80-90 Shore A durometer hardness.

B. Spacer Shims: Neoprene; EPDM or silicone blocks, Shore A durometer hardness; self-adhesive one face.

C. Glazing Gasket: Resilient polyvinylchloride extruded shape to suit glazing channel retaining slot with prefabricated molded corners. Color to be selected by Architect from manufacturer’s full range of colors.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories: Mirror adhesive, chemically compatible with mirror coating and wall substrate.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready for Work of this Section.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses.

C. Prime surfaces scheduled to receive sealant.

3.3 EXTERIOR DRY METHOD (PREFORMED GLAZING AT ALUMINUM STOREFRONT SYSTEM)

A. Cut glazing tape to length; install on glass pane. Seal corners by butting tape and dabbing with butyl sealant.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glass on setting blocks and push against fixed stop with sufficient pressure to attain full contact at perimeter of pane.

D. Install removable stops without displacement of glazing gasket. Exert pressure for full continuous contact.

E. Trim protruding tape edge.

3.4 INTERIOR - DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

D. Place glazing tape on free perimeter of glazing in same manner described above.

E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

F. Knife trim protruding tape.

3.5 INSTALLATION - MIRRORS

A. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.6 CLEANING

A. After installation, mark pane with an "X" by using plastic tape or removable paste.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is completed.

END OF SECTION

SECTION 08 88 01
FIRE-RATED GLASS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fire-rated glazing as vision lights in fire-rated door applications, and as sidelights, borrowed lights, windows and transoms in fire-rated frames.

1.2 RELATED SECTIONS

A. Section 08 11 13: Standard Steel Doors and Frames.

B. Section 08 14 16: Wood Doors.

C. Section 08 51 23: Steel Windows.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E119 Methods for Fire Tests of Building Construction and Materials.

2. ASTM E2074 Methods of Fire Tests of Door Assemblies.

3. ASTM E2010 Methods for Fire Tests of Window Assemblies.

B. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.

2. NFPA 251: Fire Tests of Building Construction and Materials.

3. NFPA 252: Fire Tests of Door Assemblies.

4. NFPA 257: Fire Tests of Window and Glass Block Assemblies.

C. California Building Codes (CBC):

1. CBC-7-1: Methods for Fire Tests of Building Construction and Materials.

2. CBC-7-2: Methods for Fire Tests of Door Assemblies.

3. CBC-7-4: Methods for Fire Tests of Window Assemblies.

D. Underwriters Laboratories, Inc. (UL):

1. UL 9: Fire Tests of Door Assemblies.

2. UL 10 B: Fire Tests of Window Assemblies.

3. UL 263: Fire Tests of Building Construction and Materials.

E. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.

F. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide a fire-rated glazing manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1. Fire Rating: 60 minutes.

2. Window Certification: Window assemblies with ratings of less than 60 minutes shall be tested in accordance with ASTM E163, NFPA 257, CBC 7-4, and UL 9.

3. Wall Certifications: Window/wall assemblies with ratings of 60 minutes shall be tested in accordance with ASTM E119, NFPA 251, CBC 7-1, UL 263, ULC-S101 Standard Test Methods for Fire Tests of Building Construction and Materials.

4. Door Certifications: Doors shall be tested in accordance with ASTM E152, NFPA 252, CBC 7-2, UL 10b or CAN4-S104 Standard Test Methods of Fire Tests of Door Assemblies.

5. Testing Laboratory: Fire test shall be conducted by an approved independent testing laboratory, similar to Warnock Hersey International or Underwriter's Laboratories, Inc.

B. Listings and Labels: Fire rated glazing shall be under current follow-up service by an approved independent agency and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

1.5 SUBMITTALS

A. Submit under provisions of section 01 33 00.

1. Shop Drawings: Submit Shop Drawings showing layout, profiles and product components.
2. Samples: Submit Samples for finishes, colors and textures.

3. Technical Information: Submit latest edition of manufacturer's Product Data providing product descriptions, technical data and installation instructions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of Section 01 87 00.

B. Delivery: Deliver materials to specified destinations in manufacturer's or distributor's packaging undamaged, and complete with installation instructions.

C. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature and conditions recommended by manufacturer.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on Shop Drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for Project warranty provisions.

B. Manufacturer's Warranty: Submit, for District's acceptance, manufacturer's standard warranty document. Manufacturer's warranty shall be in addition to, and not a limitation of, other rights District may have under the Contract Documents.

1. Warranty Period: 5 years commencing on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIRE RATED GLAZING

A. Manufacturer: SAFTI, a division of O'Keeffe's Inc.

B. Product: "SuperLite™" I I-60 Fire and Safety Rated Glass.

1. "SuperLite™" I I-60 Gel-filled Unit.

2. Thickness of Glazing Material: 1-5/8 inch.

3. U-Value: 0.40.

4. Weight: 11.5 pounds per square foot.

5. Sound Transmission Rating: 44 STC.

6. Light Transmission Rating: 85 percent.

7. Glazing material shall be optically clear, colorless and free from unusual distortion.

C. Manufacturer's Fire Rated Glazing Material:

1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory (Warnock Hersey or Underwriters Laboratory), fire-rating period and safety glazing standards.

2. Glazing material installed in hazardous locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80:

a. ANSI Z97.1, 100 foot-pounds.

b. CPSC 16 CFR 1201, Category II, 400 foot-pounds.

D. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Glazing Accessories: Manufacturer's recommended fire-rated glazing accessory as follows:

1. Glazed with EPDM tape or other listed flame resistant gasket material and calcium silicate setting blocks.

2.3 RELATED PRODUCTS

A. Framing Systems: Refer to 08 14 16 for related framing systems materials.

B. Glazing shall be installed in a fire rated framing system meeting ASTM E2010, NFPA 257, UL 9, CBC 7-4 and ASTM E2074, NFPA 252, UL 10b, CBC 7-2, and wall standards E119, NFPA 251, CBC 7-1, UL 263 and UL Standard CAN4S1-7.

2.4 SOURCE QUALITY

A. Source Quality: Obtain fire rated glazing products from a single manufacturer.

B. Fabrication Dimensions: Fabricate glass to approved dimensions. The Contractor shall guarantee dimensions are within required tolerances.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's Product Data including product technical bulletins and installation instructions.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions have been previously installed under other Sections, and are acceptable for product installation in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Installation shall be in strict accordance with the fire resistant glazing material manufacturer's specifications. Field cutting or tampering is strictly prohibited.

3.4 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent Work areas. Clean installed products in accordance with manufacture's instructions prior to District acceptance. Remove construction debris from Project site and legally dispose of debris.

END OF SECTION

SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Louvers and frames.

B. Bird screening.

1.2 REFERENCES

A. AMCA 500 - (Air Movement Council Association) Test Method for Louvers, Dampers, and Shutters.

B. ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

C. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot- Dip Process.

D. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot- Dip Process.

1.3 SYSTEM PERFORMANCE

A. Fabricate louver to permit 50 percent free area.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of AMCA certified louvers with five years experience.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate layout, elevations, dimensions, and tolerances; head, jamb, and sill details; blade configuration; screening; and frames.

C. Provide Product Data on preassembled louvers describing design characteristics, maximum recommended air velocity, free area, materials, and finishes.

D. Submit two 6-inch square Samples illustrating finish and color of exterior prefinish.

E. Submit manufacturer's installation instructions.

1.6 COORDINATION

A. Coordinate Work of this Section with installation of flashings under Section 07 60 00.

B. Coordinate Work of this Section with mechanical ductwork.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Carnes

B. Ruskin

C. The C/S Group.

D. The Airolite Co. (as a standard of quality).

2.2 MATERIALS

A. Aluminum: ASTM B221, 6063 alloy, T5 or T52 temper; extruded shape.

B. Steel Sheet: ASTM A653, Commercial Steel, Type A, galvanized to G90 zinc coating in accordance with ASTM A924.

C. Fasteners and Anchors: Stainless steel type.

2.3 ACCESSORIES

A. Bird Screen: Interwoven wire mesh of aluminum 0.063 inch diameter wire, 1/2 inch open weave, square design.

B. Insect Screen: 18 x 16 size aluminum mesh, set in aluminum frame.

C. Primer: Zinc chromate, alkyd type.

D. Flashings: Of same material as louver frame.

2.4 FINISHES

A. Steel Surfaces: Shop coat of primer for site painting under provisions of Section 09 91 00.

B. All louvers where not used in conjunction with other aluminum products shall be finish painted to match color of adjacent surfaces.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that prepared openings and flashings are ready to receive Work and opening dimensions are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Secure louvers in opening framing with concealed fasteners.

D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Install insect screens to exhaust louvers. Install bird screens to all exterior louvers.

3.3 CLEANING

A. Clean surfaces and components.

END OF SECTION

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SECTION 09 24 00
PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal furring and lathing and suspended ceiling framing.

B. Portland cement plaster system.

C. Machine applied surface finish.

D. Application over existing plaster finish.

E. Cutting and patching.

1.2 REFERENCES

A. ASTM C91 - Masonry Cement.

B. ASTM C150 - Portland Cement.

C. ASTM C206 - Finishing Hydrated Lime.

D. ASTM C207 - Hydrated Lime for Masonry Purposes.

E. ASTM C847 - Standard Specifications for Metal Lath.

F. ASTM C897 - Aggregate for Job-Mixed Portland Cement-Based Plasters.

G. ASTM C926 - Application of Portland Cement-Based Plaster.

H. ASTM C932 - Surface-Applied Bonding Agents for Exterior Plaster.

I. ASTM C954 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inches to 0.112 inches in thickness.

J. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

K. ASTM C1063 - Installation of Lathing and Furring for Portland Cement Based Plaster.

L. ASTM C 1032 – Standard Specification for Woven Wire Lath

M. ITS (DIR) – Directory of Listed Products; Intertek Testing Services NA, Inc.

N. NAAMM Standard ML/SFA 920 - Guide Specifications for Metal Lathing and Furring.

O. PCA (Portland Cement Association) – Portland Cement Plaster (Stucco) Manual.

P. UL (FRD) – Fire Resistance Directory; Underwriters Laboratories Inc.

Q. CCR - California Code of Regulations, Title 24, Part 2, Chapter 25.

R. ICBO - International Conference of Building Officials.

S. CBC – California Building Code, Chapter 25.

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in cement plaster work with five years documented experience.

B. At the completion of lathing and prior to the application of scratch coat of plaster, contact the Northern California Plastering Institute, Inc., and arrange for inspection of lathing and accessories installation. Provide to Architect a written report of the results of the inspection.

C. Lath and related accessories shall provide proper, secure base and reinforcement for plaster systems. Plaster base coats shall provide suitable base for finish coat.

1.4 REGULATORY REQUIREMENTS

A. Conform to CBC, Chapter 7, for fire rated assemblies as indicated on Drawings.

B. Conform to CCR, Title 24, Part 2, Chapter 25A for materials and their installation.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide Product Data on plaster materials, characteristics and limitations of products specified.

C. Submit Samples of texture for plaster finish, building paper, flashing membrane, lath, accessories, trim, and fasteners.

D. Samples: Submit two samples, 12 x 12 inch (minimum) in size illustrating finish color and texture. Provide color samples of sealants. Provide physical samples of each type of fastener and anchorage.

1.6 MOCK-UP

A. Prepare field mock-up of an area at least 4 feet wide. Mock-up shall include finish treatment at all openings, joints and other elements of the architecture, in accordance with the selected patterns.

B. Mock-up, once approved, may be integrated into the Work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with requirements of Section 01 60 00.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

C. Keep plaster and other cementitious materials dry until ready for use. Keep materials off ground, under watertight covers, and away from damp surfaces.

D. Protect metal products from rusting.

E. Remove from site any damaged or deteriorated materials.

F. Stack preformed material to prevent twisting, bending, abrasion, staining, or corrosion and to provide ventilation.

G. Prevent contact with materials during storage which may cause damage, discoloration, staining, or drainage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply plaster when substrate or ambient air temperature is less than 40 degrees Fahrenheit nor more than 90 degrees Fahrenheit.

B. Maintain minimum ambient temperature of 40 degrees Fahrenheit during and after installation of plaster.

C. Protect plaster from uneven and excessive evaporation during dry weather and from strong blasts of dry air.

D. Do not subject newly applied plaster to hot, dry winds.

E. Do not install exterior plaster when prevailing temperature is less than 40 degrees Fahrenheit.

F. When ambient air temperature exceeds 80 degrees Fahrenheit, follow procedures for maintaining moisture content in new plaster.

G. Do not apply plaster when substrate temperature exceeds 85 degrees Fahrenheit or ambient air temperature exceeds 95 degrees Fahrenheit.

H. Provide protection against accelerated dehydration caused by wind. Protect cement plaster from uneven and excessive evaporation during hot and/or windy weather.

I. Fine spray plaster twice daily after 24 hours.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Lathing Materials:

1. Western Metal Lath Division.
2. Amico-West.
3. CEMCO.
4. BMI Products – A Sika Company

B. Accessories:

1. Fry Reglet Corp.
2. Keene Metal Products Division.
3. M.M. Systems Corporation.
4. CEMCO.
5. Amico-West.
6. Superior Metal Trim.
7. Stockton Wire Products.
8. Western.

C. Substitutions: Under provisions of Section 01 62 00.

2.2 PLASTER BASE COAT MATERIALS

A. Cement: ASTM C150, Normal - Type I, Portland or ASTM C91, masonry.\

B. Lime: ASTM C206, Type S for use with Portland cement or ASTM C207, Type S, for use with masonry cement.

C. Aggregate: In accordance with ASTM C897 and PCA Plaster (Stucco) Manual.

D. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

E. Plaster Mix Reinforcement: Glass fibers, 1/2 inch nominal length, alkali resistant.

F. Bonding Agent: ASTM C932; type recommended for bonding plaster to concrete, concrete masonry surfaces and existing plaster surfaces. Larsen Products Corp. “Weld-Crete”. Substitutions under provisions of Section 01 62 00.

G. Sand: ASTM C144.

2.3 PLASTER FINISH COAT MATERIALS

A. Cement: As specified for plaster base coat, grey color.

B. Lime: ASTM C 206, Type S. As specified for plaster base coat.

C. Aggregate: In accordance with ASTM C 897.

D. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

E. Finish: Site paint under provisions of Section 09 91 00.

2.4 FURRING AND LATHING

A. Metal Lath for Vertical Surfaces: ASTM C847, 3.4 lb/sq. yd. expanded metal, galvanized, self furring type with continuous groove.

B. Metal Lath for Horizontal Surfaces: ASTM C847, 3.4 lb./sq. yd expanded metal, galvanized, 3/8 inch rib lath with factory applied Kraft paper backing.

C. Wire Lath for Vertical/Horizontal Patchwork: 1-1/2 x 17 gage woven galvanized wire.

D. Underlayment: Two layers of WRB Type D building paper conforming to CBC Standard No. 14-1.

2.5 ACCESSORIES

A. Corner Mesh: Formed steel, minimum .0179 inch thick; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inches wide; galvanized finish.

B. Corner Reinforcement: Equivalent to Western Metal, .0179 inch “Stucco-Lok” or 18 gage Stockton “Corneraid” for straight corners. Stockton “Bullnose Regular” for rounded corners, galvanized finish.

C. Strip Mesh: Metal lath, 3.4 lb/sq. yd. expanded metal, galvanized, 6 inch wide x 18 inch long.

D. Vent Screed: Equivalent to Superior SRS, minimum .0179 inch thick; depth governed by plaster thickness, minimum 4 inch width, double "V" profile with perforated expanse between "V's" of longest possible lengths; galvanized finish.

E. Casing Bead: Formed steel; minimum .0239 inch thick; thickness governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges; galvanized finish.

F. Curved Casing Bead: Square-edged style fabricated from aluminum, preformed into curve or radius indicated.

G. Weep Screed: Equivalent to Superior SWS, minimum .0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, "V" shaped, of longest possible lengths; galvanized finish.

H. Drip Screed: Equivalent to Superior No. 5 or No. 10 drip mould as indicated on drawings, minimum .0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, of longest possible lengths; galvanized finish.

I. Window/Door Drip Screed: Equivalent to Superior SWD, minimum .0179 inch thick; depth governed by plaster thickness, minimum 3-1/2 inch high flange, of longest possible lengths; galvanized finish.

J. Control and Expansion Joints: Equivalent to Western XJ 15-3, depth to conform to plaster thickness, maximum practical lengths, galvanized finish.

K. Interior Corner Joints: Equivalent to Western No. 30, depth to conform to plaster thickness, maximum practical lengths, galvanized finish.

L. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

M. Screws: ASTM C954 or ASTM C1002, self drilling.

N. Penetration Flashing: Type 1, Grade A conforming to CBC Standard 14-1, 9 inch wide x length required.

O. Polyethylene Sheet: Clear, 6 mil thick, with self-adhesive tape.

P. Wire: ASTM A641, Class 1 coating (galvanized), soft temper.

Q. Powder Activated Fastener: 0.145 inch diameter SDM flat head nail with washer as manufactured by Hilti, Inc., ICBO Report No. 2388.

2.6 SUSPENDED METAL CEILING FRAMING

A. Runner Channels: 1-1/2 inch high cold rolled steel, .475 lb./ft., galvanized or coated with rust inhibitive paint; length as required.

B. Furring Channels: 3/4 inch high cold rolled steel, .30 lb./ft., galvanized or coated with rust inhibitive paint.

C. Hanger Wires: ASTM A641, No. 8 gauge galvanized soft temper wire.

D. Tie Wire: ASTM A641, No. 18 gauge galvanized soft temper wire.

E. Compression struts as indicated on Drawings.

2.7 CEMENT PLASTER MIXES

A. Mix and proportion cement plaster in accordance with ASTM C926 and PCA Plaster (Stucco) Manual.

B. Base Coat and Brown Coat: One part cement, minimum 3-1/2 and maximum 4 parts aggregate, and 0-3/4 parts hydrated lime, and alkali resistant glass fibers at a rate of 1 lb. per sack of cement.

C. Job Mixed Finish Coat: One part cement, three parts aggregate, and one part lime.

D. Mix only as much plaster as can be used in 1 hour.

E. Mix materials dry, to uniform color and consistency, before adding water.

F. Protect mixtures from frost, contamination, and evaporation.

G. Do not retemper mixes after initial set has occurred.

2.8 CEMENT PLASTER FINISHES

A. Unless noted otherwise, all interior plaster surfaces shall be smooth finish.

B. All exterior plaster surfaces below 9 feet shall be smooth finish. Finishes above 9 feet may be lightly textured in accordance with those patterns indicated in the Portland Cement Plaster (Stucco) Manual and as approved by the Architect.

C. Plaster surface finishes must be capable of receiving roller-applied paint (medium texture) without leaving pinholes or voids.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that surfaces and site conditions are ready to receive Work.

B. Grounds and Blocking: Verify items within walls for other Sections of Work have been installed.

C. Mechanical and Electrical: Verify services within walls have been tested and approved.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION FOR PATCHING

A. Remove existing plaster as necessary to install metal lathing and accessories as specified herein and as per manufacturer's instructions. Expose at least 6 inches of both lath and building paper. Leave an irregular plaster edge (no sawn edges permitted). Remove all loose plaster.

B. Protect surfaces near the Work of this Section from damage, disfiguration, and overspray. Mask off all windows, louvers, and ventilation screeds occurring in plastered areas.

C. Sandblast existing plaster surface to expose entire base coat.

D. Clean concrete, masonry, and sandblasted plaster surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

E. Roughen smooth concrete surfaces.

F. Moisten exposed plaster edges. Apply bonding agent in accordance with manufacturer's instructions.

G. Insert 8 inch x 12 inch felt paper “tiles” shingle-style starting at the bottom, running continuously all around the edge of the patched area. Place margin of tiles under the irregular plaster and lapping that edge by 2 inches; fasten securely.

H. Place a continuous 3/16 inch bead of asphalt sealant into the joint between the original felt paper and the irregular plaster edge (for exterior applications).

I. Overlap new felt paper over the original paper, scribing to the irregular plaster edge.

J. Overlap the new lathing over the original lathing and secure the edge with the approved fastener.

3.3 INSTALLATION - LATHING MATERIALS

A. Install metal lathing in accordance with ML/SFA 920, ASTM C1063 and as specified herein.

B. On vertical surfaces apply two plies of WRB underlayment over substrate; weatherlap horizontal edges 4 inches, vertical edges 6 inches. Fasten in place.

C. Install penetration flashing around all openings and penetrations in exterior walls, soffits and ceilings in compliance with CCR, Title 24, Part 2, Section 1402A, including sealant and in conformance with recommendations contained in Plaster and Lathing Systems Manual and ML/SFA 920.

D. Apply self-furring reinforcement with self-furring ribs perpendicular to supports for horizontal surfaces.

E. Apply metal lath taut, with long dimension perpendicular to supports for vertical surfaces.

F. Lap ends minimum 1 inch. Secure end laps with tie wire where they occur between supports.

G. Lap sides of expanded metal lath minimum 1-1/2 inches. Nest outside ribs of rib lath together.

H. Furr out metal lath from vertical supports or backing not less than 1/4 inch. Furring of metal lath on vertical supports having a bearing surface width of 1-5/8 inches or less is not required.

I. Attach metal lath to vertical metal supports with tie wires or No. 8 self drilling screws with 3/8 inch diameter wafer head capable of penetrating metal supports by not less than 1/4 inch. Maximum spacing 6 inches on center.

J. Attach metal lath to horizontal metal supports with tie wires or No. 8 self drilling screws with 3/8 inch diameter wafer head fitted with 1 inch O.D. x 1/4 inch I.D. x 16 gage galvanized cut washers capable of penetrating metal supports by not less than 1/4 inch.

K. Attach metal lath to wood supports using 1-1/2 inch No. 11 galvanized nails with 7/16 inch diameter heads at maximum 6 inches on center. In addition, at horizontal wood supports, secure lath to each support with 1/2 inch wide, 1-1/2 inch long No. 9 W & M gage ring shank, hook staple placed around a 10d common nail laid flat under the surface of the lath at 27 inches on center and not more than 3 inches from the edge of each sheet. Such staples may be placed over the ribs of 3/8 rib lath or over the back wire of other approved lath at 27 inches on center omitting the 10d nails.

L. Continuously reinforce internal angles with corner mesh, except where corner joint No. 30 is shown. Fasten at perimeter edges only.

M. Place beaded external angle with mesh at corners. Fasten at outer edges only.

N. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

O. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

P. Place window/door drip screed at head of all windows and door openings in exterior walls.

Q. Place weep screed at base of all vertical plaster applications at foundation line not less than 4 inches above earth or 2 inches above paved surfaces. WRB underlayment and lath shall cover and terminate on the attachment flange of the screed.

R. Place drip screed at base of all vertical plaster applications which do not terminate at framed wall openings or at foundation line.

S. Place vent screed in soffit areas as indicated.

T. Place casing beads at all terminations of plaster finish not otherwise indicated to have screeds installed and at all intersections with dissimilar materials. Butt and align ends. Secure rigidly in place.

U. Install accessories to lines and levels.

3.4 INSTALLATION - SUSPENDED METAL CEILING FRAMING

A. Install in accordance with ASTM C1063.

B. Coordinate location of hangers with other Work.

C. Install ceiling framing independent of walls and columns.

D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum of 24 inches past end of openings.

3.5 CONTROL AND EXPANSION JOINTS

A. Locate interior control and expansion joints as indicated on the Drawings, but not to exceed 20 feet on center, horizontally or vertically.

B. Locate exterior control and expansion joints as indicated on Drawings.

C. Establish control and expansion joints with specified joint device.

D. Install expansion joint in such a way as to assist with air seal continuity.

E. Coordinate joint placement with other related Work.

3.6 PLASTERING

A. Apply plaster in accordance with ASTM C926 and PCA Portland Cement Plaster (Stucco) Manual.

B. Three Coat Application: At metal lathed surfaces, apply scratch coat to a nominal thickness of 3/8 inch, brown coat to a nominal thickness of 3/8 inch, and finish coat to a nominal thickness of 1/8 inch. [Apply elastromeric finish coat.]

C. Two Coat Application: Apply bonding agent to substrate. Wet surface if required. At concrete, masonry, and existing plaster surfaces, apply 3/8 inch thick leveling coat and then 1/8 inch finish coat. [Apply elastomeric finish coat.]

D. No flat horizontal surfaces in restrooms. Restrooms are designed to be hosed down daily. Plaster at base of windows, tops of stub walls and other flat surfaces shall be gently sloped so as not to allow any standing water.

E. Coved corners and beveled edges in restrooms: All inside corners and intersections of walls and ceilings shall receive a 1/2 inch cove. All beveled edges around windows, doors, and other projections shall receive a 1/2 inch beveled edge.

F. Moist cure scratch and brown coats. Do not apply brown coat sooner than 48 hours following scratch coat.

G. After curing, dampen base coat prior to applying finish coat. Do not apply finish coat sooner than 7 days following brown coat.

H. Apply finish plaster in two coats evenly and uniformly. Machine or trowel or finish spray as indicated. Apply as recommended based on finish texture selected. Apply first coat to provide texture pattern; second coat to obtain uniformity in color and texture.

I. Moist cure finish coat for minimum period of 48 hours only when strong dry wind conditions exist.

3.7 FINISH COAT TEXTURE

A. Medium Sand Float as defined by photographs and application procedures in Plaster and Lathing Systems Manual, Third Edition, and as indicated.

3.8 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

3.9 CLEANING

A. Remove protective maskings.

B. Remove any overspray from surrounding materials.

C. Clean adjacent affected surfaces.

3.10 PLASTER APPLICATION SCHEDULE

A. Exterior Vertical Surface of Existing Plaster Building Walls: Two coat plaster over bonding agent.

B. Exterior Vertical Surface of Existing Plaster Building Walls Where Necessary: Three coat plaster over metal lath and underlayment.

C. Exterior Vertical Surface of Framed Walls: Three coat plaster over metal lath and underlayment.

D. Exterior Horizontal Framed Surfaces: Three coat plaster over metal lath.

E. As indicated on Drawings.

END OF SECTION

SECTION 09 28 13
CEMENTITIOUS BACKING BOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Membrane under backing board.

B. Cementitious backing board.

C. Preparation of surface to receive special coatings.

1.2 REFERENCES

A. ANSI/TCA A108.11 - Interior Installation of Cementitious Backer Units.

B. ANSI/TCA A118.4 - Latex-Portland Cement Mortar.

C. ANSI/TCA A118.9 - Test Methods and Specifications for Cementitious Backer Units.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data for materials specified.

C. Samples of backing board and membrane.

1.4 QUALITY ASSURANCE

A. Conform to ANSI/TCA A108.11 and A118.9 for backing board.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Installer: Company specializing in applying the Work of this Section with minimum five years documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees Fahrenheit during installation.

PART 2 - PRODUCTS

2.1 BACKING BOARD MATERIALS

A. Backing Board: ANSI/TCA A118.9; high density, cementitious, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners; manufacturer shall be licensed by TCA. Material containing “Styrofoam” additive or a rippled or pinholed surface will be rejected.

2.2 MORTAR MATERIALS

A. Epoxy Grout Mortar: ANSI A108.6 and A118.3

2.3 ACCESSORIES

A. Vapor Barrier: ASTM D226; “Tyvek” or approved equal. Provide on stud face for full height of wall.
B. RedGard Waterproofing and crack prevention membrane or approved equal. Provide over surface of cementitious backer board. Overlap 6 inches to adjacent gypsum wallboard surface where applicable.

2.4 JOINT FILLER MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and referenced standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

3.3 INSTALLATION

A. Install vapor barrier over substrate; weatherlap horizontal edges 4 inches, lap vertical edges 6 inches, and tape all joints as recommended by manufacturer.

B. Coordinate installation of backing board with application of finish surfaces. Install with the rough side exposed.

C. Install backing board in accordance with manufacturer's instructions and ANSI/TCA A108.11. Tape joints and corners. Chamfer all exposed corners to create a 1/2 inch radius. Install waterproofing and crack prevention membrane to manufacturer’s recommendations.

3.4 CLEANING

A. Clean Work under provisions of DIVISION 1.

END OF SECTION 09 28 13

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Gypsum board.

B. Taped and sanded joint treatment.

C. Surface primer.

D. Texture finish.

E. Level 5 finish, if indicated.

1.2 REFERENCES

A. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems.

B. ASTM C1396 - Gypsum Wallboard.

C. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

D. ASTM C514 - Nails for the Application of Gypsum Wallboard.

E. ASTM C557 - Adhesives for Fastening Gypsum Wallboard to Wood Framing.

F. ASTM C630 - Water Resistant Gypsum Backing Board.

G. ASTM C641 - Zinc-Coated (Galvanized) Carbon Steel Wire.

H. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

I. ASTM C754 - Installation of Steel Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.

J. ASTM C840 - Application and Finishing of Gypsum Board.

K. ASTM C919 - Use of Sealants in Acoustical Applications.

L. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.

M. ASTM D226 - Asphalt-Saturated Felt Used in Roofing and Waterproofing.

N. ASTM E90 - Method for Laboratory Measurement of Airborne Sound transmission Loss of Building Partitions.

O. GA 201 - Using Gypsum Board for Walls and Ceilings.

P. GA 214 - Levels of Gypsum Board Finish.

Q. GA 216 - Application and Finishing of Gypsum Board.

R. GA 600 - Fire Resistance Design Manual.

S. UBC - Uniform Building Code.

T. UL - Underwriters Laboratories.

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems, with five years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Conform to UBC, Chapter 7, and UL and GA requirements for fire-rated assemblies.

1.5 ACOUSTICAL PERFORMANCE

A. Acoustical attenuation for interior partitions, where indicated, shall be STC rating in accordance with ASTM E90.

1.6 DEFINITIONS

A. Refer to ASTM C11 for definitions of terms related to gypsum board assemblies.

1.7 FIELD SAMPLES

A. Provide field samples under provisions of Section 01 33 00.

B. On wall and ceiling surface duplicate specified texture finish on at least 100 square feet of surface area.

C. Provide complete finish including surface primer.

D. Simulate finished lighting conditions for review of field sample.

E. After surface texture is accepted, the accepted surface will remain as part of the Work and will be used to evaluate subsequent applications of finish texture.

1.8 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide Product Data for all items specified.

C. Submit 12 inch square Samples of each texture finish specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. National Gypsum Company.

B. United States Gypsum Co..

C. Georgia Pacific Corp.

D. Substitutions: Under provisions of Section 01 62 00.

2.2 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; 5/8 inch thick unless otherwise indicated, maximum permissible length; ends square cut, tapered and beveled edges.

B. Moisture-Resistant Gypsum Board: ASTM C630; 5/8 inch thick unless otherwise indicated, maximum permissible length; ends square cut, tapered and beveled edges.

2.3 ACCESSORIES

A. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

1. “Sheetrock Acoustical Sealant”, manufactured by United States Gypsum Company.

2. “BA-98 Acoustical Sealant”, manufactured by Pecora Corporation.

3. “Tremco Acoustical Sealant”, manufactured by Tremco, Inc.

B. Corner Beads: Metal, hot dip galvanized.

C. Edge Trim: GA 201 and GA 216; Type LC bead, unless otherwise indicated.

D. Control Joints: Roll-formed zinc, USG No. 093, or approved equal. Locations: Install every 30 feet in partitions and wall furring; every 50 feet on center in ceiling areas exceeding 2,500 sq. ft.

E. Spot Grout: ASTM C475, setting-type joint compound.

F. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners. Use tapes and compound recommended by gypsum board manufacturer for the use intended. Use ready mixed, drying type compounds. Use taping compound for embedding tape and first coat over fasteners and flanges of corner beads and trim. Use topping compound for fill and finish coats.

G. Primer: Flat latex basecoat paint equivalent to “First Coat” manufactured by United States Gypsum Company.

H. Spray Texture Finish: Equivalent to “USG Spray Texture Finish”, orange peel texture, manufactured by United States Gypsum Company.

I. Other Textures: To match existing.

J. Membrane: ASTM D226; No. 15 asphalt saturated roofing felt.

K. Adhesive for Application Over Hard Surfaces: Mastic glue as recommended by the gypsum board manufacturer for the specific substrate.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that site conditions are ready to receive Work.

B. Beginning of installation means acceptance of substrate.

3.2 ACOUSTICAL ACCESSORIES INSTALLATION

A. Install acoustical sealant within partitions in accordance with manufacturer's instructions and ASTM C919. Seal perimeter, joints, openings and penetrations on each face of partition.

3.3 MEMBRANE INSTALLATION

A. Install membrane over wall studding where moisture resistant gypsum board is to be installed.

B. Install membrane over substrate; weatherlap horizontal edges 4 inches, vertical edges 6 inches.

3.4 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with ASTM C840 and manufacturer's instructions.

B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing except those ends and edges which are perpendicular to framing.

C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing except those ends and edges which are perpendicular to framing members. Comply with required UL, UBC, or GA fire rated assembly.

D. Erect double layer gypsum board with standard gypsum board for first layer placed in most economical direction with second layer placed parallel to face layer with adhesive and supplementary fasteners. Off-set joints of second layer from joints of first layer by at least 12 inches.

E. Erect double layer fire-rated gypsum board in accordance with required UL, UBC, or GA fire rated assembly.

F. Use screws when fastening gypsum board to metal furring.

G. Use screws when fastening gypsum board to wood furring or framing except where nails are required for UL or UBC fire-rated assembly.

H. Install firestop sealant at wall penetrations and terminations in accordance with required UL, UBC, or GA fire-rated assembly, where occurs.

I. Treat cut edges and holes in moisture-resistant gypsum board with sealant.

J. Place control joints as indicated on the Drawings.

K. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

L. Spot grout metal door frames. Apply spot grout at each jamb anchor clip just before inserting board into frame.

3.5 JOINT TREATMENT

A. Tape, fill, and sand joints, edges, and corners in accordance with GA-214.

B. Feather successive coats a minimum of 2 inches onto adjoining surfaces for each coat.

C. Where fire-resistance rating is required, detail of joint treatment shall meet fire-rating requirement.

D. Level 1 Treatment:

1. All joints and angles shall have tape embedded in joint compound.

2. Surface shall be free of excess joint compound.

3. Tool marks and ridges are acceptable.

4. Use for plenum areas above ceiling, in areas that are generally concealed and other areas not normally open to view.

E. Level 2 Treatment:

1. All joints and angles shall have tape embedded in joint compound and one separate coat of joint compound shall be applied over all fastener heads and accessories.

2. Surface shall be free of excess joint compound.

3. Tool marks and ridges are acceptable.

4. Use where surface is substrate to ceramic tile, acoustic tile, or tackable wallboard system.

F. Level 3 Treatment:

1. Not used.

G. Level 4 Treatment:

1. All joints and angles shall have tape embedded in joint compound with three separate coats of topping compound applied over all joints, angles, fasteners, and accessories.

2. All compound shall be smooth and free of tool marks and ridges.

3. Sand lightly between coats, taking care not to roughen face paper.

4. Use for all surfaces that are scheduled to receive a textured and painted finish, except areas of food service and preparation, or a surface applied wallcovering.

5. Where patching skip-trowel, knock-down or other finishes, match existing to the greatest extent possible.

H. Level 5 Treatment:

1. All joints and angles shall have tape embedded in joint compound with three separate coats of topping compound applied over all joints, fasteners, and accessories.

2. Apply a thin skim coat of topping compound over entire surface.

3. All compounds shall be smooth and free of tool marks and ridges.

4. Sand lightly between coats.

3.6 FINISHING

A. Roller apply surface primer to all gypsum board surfaces scheduled to receive a painted and textured finish prior to application of paint or texture finish.

B. Spray apply textured finish to all surfaces scheduled to receive a paint finish except surfaces of food service and preparation areas.

C. Trowel-apply patch-to-match textures to match existing.

D. Remove any overspray of texture finish from door frames, windows, and other adjoining construction.

3.7 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

3.8 SCHEDULE

A. Existing Construction: Patch-to-match, or if exceeds 30% of existing wall, strip and replace to the nearest surface break and treat this area as new construction.

Room Type	Wallboard System	Finish Type	Notes
Gang Toilets (Ceilings)	1/2", Type X	Level 5	
Gang Toilet Wall (Above tile assembly)	5/8", Type MR	Level 5 or coordinate with final surface	If tile, substrate is specified elsewhere.
Gang Toilet wall (Tile assembly See 09 28 13)	SEE 09 28 13		

END OF SECTION

SECTION 09 30 13
CERAMIC TILE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glazed ceramic tile.

B. Porcelain mosaic tile.

C. Cementitious backing board.

D. Grout.

E. Accessories.

1.2 REFERENCES

A. ANSI/TCA A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

B. ANSI/TCA A108.11 - Interior Installation of Cementitious Backer Units.

C. ANSI/TCA A118.1 - Dry-Set Portland Cement Mortar.

D. ANSI/TCA A118.4 - Latex-Portland Cement Mortar.

E. ANSI/TCA A118.6 - Ceramic Tile Grouts.

F. ANSI/TCA A118.9 - Test Methods and Specifications for Cementitious Backer Units.

G. ANSI/TCA A137.1 - Specifications for Ceramic Tile.

H. ASTM C1028 – Static Coefficient of Friction of Ceramic Tile.

I. ASTM D226 - Asphalt-Saturated Felt Used in Roofing and Waterproofing.

J. ASTM D2047 – Static Coefficient of Friction Test.

K. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Submit Product Data for all materials specified.

C. Samples: Mount tile and apply grout on two 24 inch x 24 inch plywood panels, representative of pattern, color variations, and grout joint size variations.

D. Submit manufacturer's installation instructions, maintenance data, and recommended cleaning and stain removal methods and cleaning materials.

1.4 QUALITY ASSURANCE

A. Conform to ANSI/TCA A137.1 for tile material.

B. Conform to ANSI/TCA Standards and TCA Handbook for tile installation.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five years documented experience.

B. Installer: Company specializing in applying the Work of this Section with minimum five years documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees Fahrenheit during installation of mortar materials.

1.7 EXTRA STOCK

A. Provide extra quantity of full size tile and trim shape units to District under provisions of Section 01 70 00.

B. Provide quantity equal to 2 percent of units installed of each shape and color.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - TILES

A. Field Tile: Dal-Tile Corp., “Natural Hues” Series.

B. Floor Tile: Dal-Tile Corp. Mosaic, Colorbody Porcelain

C. Accent Tile: Crossville Longust,

D. Substitutions: Under provisions of Section 01 62 00.

2.2 TILE MATERIAL

A. Ceramic Wall Tile: Field: Daltile Semi-gloss, Accent: Crossville Semi-gloss

1. Moisture Absorption: < 20.0%

2. Pattern: To be selected by Architect from manufacturer’s full range of patterns.

3. Size:

a. Field Tile: 6 inches x 6 inches or 8 inches x 8 inches. See drawings.

b. Accent Tile: 4 inches x 8inches

4. Tile Thickness: 5/16.

5. Surface Finish: Matt Glazed.

6. Grout Joint : 1/16"

7. Color(s): To be selected by Architect from manufacturer's full range of colors.

8. Break Strength: 120-230 lbs.

B. Ceramic Floor Tile: Daltile Keystones Mosaic Colorbody Porcelain

1. Pattern: To be selected by Architect from manufacturer's full range of patterns.

2. Size: 2 inches x 2 inches.

3. Thickness: 1/4".

4. Grout Joint: 1/16" .

5. Surface Finish: Non-Slip with Coefficient of friction of 0.60 or greater, when tested in acceptance with ASTM C1028 or ASTM D2047.

2.3 MANUFACTURERS - MORTAR AND GROUT

A. Bostik

B. Custom Building Products

C. Substitutions per Division 1.

2.4 MORTAR MATERIALS

A. Full Bed Portland Cement Mortar Materials: ANSI/TCA A118.1.

B. Latex-Portland Cement Mortar: ANSI/TCA A118.4.

1. Acrylic resin latex additive.

2. Dry mortar mix supplied by latex manufacturer.

2.5 GROUT MATERIAL

A. Epoxy Grout: ANSI A118.3

1. Bostik: EzPoxy EzClean 100% Solid Epoxy

2. Custom Building Products: CEG-LIT 100% Solid Epoxy

3. Approved Equal

ACCESSORIES

A. Vapor Membrane: ASTM D226; No. 15 asphalt saturated roofing felt.

B. Waterproofing and Crack Prevention Membrane: ANSI A118.10, RedGard by Custom Building Products or approved equal.

C. Backing Board: ANSI/TCA A118.9; high density, cementitious, glass fiber reinforced, 1/2 inch thick minimum; 2 inch wide coated glass fiber tape for joints and corners; manufacturer shall be licensed by TCA. See Section 09 28 13.

D. Sealant: Type specified in Section 07 90 00.

E. Coved Profiles:

1. Provide horizontal coved profiles at wall base and all corners.

2. Product: Schluter – DILEX-EHK

3. Provide 2-way Outside corner and Inside Corner

4. Provide End Cap at termination.

5. Brushed stainless steel 304 finish

2.6 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions and referenced standards.

B. Epoxy Grout – employ epoxy grout resin and hardener portions at floor and walls.

2.7 SEALER

A. As recommended by tile and/or grout manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding Work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - GENERAL

A. Install mortar, tile, and grout in accordance with ANSI/TCA 108.5 and applicable tile installation standards of the TCNA Handbook.

B. Install membrane over substrate; weatherlap horizontal edges 4 inches, lap vertical edges 6 inches.

C. Lay tile to pattern indicated. If not indicated, request from Architect. Do not interrupt tile pattern around openings.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align wall, base, and floor joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

F. Form internal angles square and external angles bullnosed.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control joints free of mortar or grout. Apply sealant to joints.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - THINSET METHOD

A. Install mortar, tile, and grout in accordance with ANSI/TCA 108.5 and applicable tile installation standards of the TCA Handbook. Shower areas in accordance with TCA B415-09

B. Install backing board in accordance with manufacturer's instructions and ANSI/TCA A108.11. Tape joints and corners; cover with skim coat of dry-set mortar to a feather edge.

3.5 INSTALLATION - MORTAR BED METHOD

A. Install mortar, tile, and grout in accordance with ANSI/TCA 108.5 and applicable tile installation standards of the TCNA Handbook. Shower areas in accordance with TCA B414-09

3.7 CLEANING

B. Clean Work under provisions of 01 70 00.

C. Clean tile surfaces.

3.8 SEALING

D. Install sealer on all surfaces in accordance with manufacturer's instructions where applicable.

END OF SECTION 09 30 13

SECTION 09 51 53
ADHESIVE APPLIED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Acoustical tile.

B. Adhesive.

1.2 REFERENCES

A. ASTM E1264 - Classification of Acoustical Ceiling Products.

B. ASTM - D1779 - Adhesive for Acoustical Materials.

C. UL - Underwriters Laboratories Building Materials Directory.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of ceiling tile with five years experience.

B. Installer: Company with five years minimum documented experience.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide Product Data for acoustic units.

C. Submit three Samples 12 inches x 12 inches in size, illustrating material and finish of acoustic units specified.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and humidity of 20 to 40 percent prior to, during, and after installation.

1.6 EXTRA STOCK

A. Provide extra quantity of acoustic units to Owner under provisions of Section 01 70 00.

B. Provide quantity equal to five (5) percent of units installed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Armstrong Ceiling Systems, (800) 448-1405.

B. USG Interiors, Inc., (877) 874-4200.

C. Classic Acoustical, (760) 775-7745

D. Substitutions: Under provisions of Section 01 62 00.

2.2 MATERIALS

A. Acoustical Tile (ACT): ASTM E1264, as manufactured by Classic Acoustical, Inc. and conforming to the following:

(a)	Pattern Designation	:	“Straight Drilled” 58779 Product #
(b)	Size	:	12 inches x 12 inches
(c)	Thickness	:	1/2 inches
(d)	Composition	:	Mineral.
(e)	Density	:	1.04 lb/cu ft
(f)	Light Reflectance	:	84 percent (minimum)
(g)	NRC Range	:	.55 to .70
(h)	CAC Range	:	40 to 44
(i)	Flame Spread	:	(0-25) Class A, UL 25 or under
(j)	Joint	:	Beveled Butt joint
(k)	Edge	:	Square
(l)	Surface Finish	:	Painted white color

B. Adhesive: ASTM D1779; waterproof, gun or knife grade; type recommended by tile manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that existing conditions are ready to receive Work.

B. Verify that existing surface is smooth and even, so that tiles are all in one plane and precisely aligned. Provide underlayment as recommended by the manufacturer as needed for alignment of face plane.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install trim strips and/or edge molding.

B. Install acoustic units in accordance with manufacturer's instructions and as supplemented below.

C. Locate acoustic units on room axis according to reflected ceiling plan.

D. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function. Position adhesive as recommended by the manufacturer.

E. Lay patterned units for maximum uniformity of pattern. Fit border units neatly against abutting surfaces.

F. Cut edge tiles precisely and ease edges where to be exposed.

G. Install acoustic units level, in uniform plane, and free from twist, warp and dents.

3.3 TOLERANCES

A. Variation from Flat and Level Surface: 1/8 inch in 10 ft.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. VCT flooring (at existing floor patch to match adjacent existing)

B. Linoleum Tile (at new resilient floor systems).

C. Resilient top-set base.

1.2 RELATED SECTIONS

A. 03 54 16 Cast Underlayments
B. 07 26 40 Moisture Vapor Emission Control

1.3 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CCR - California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. ASTM D2047 - Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

D. ASTM E648 - Test Method for Critical Radiant Flux of Floor-Covering Systems using a Radiant Energy Source.

E. ASTM E662 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

F. ASTM F710 - Practice for Preparing Concrete Floors and other Monolithic Floors to Receive Resilient Flooring.

G. ASTM F970 – Standard Test Method for Static Load Limit.

H. ASTM F1066 - Specification for Vinyl Composition Floor Tile.

I. ASTM F1303 - Specification for Sheet Vinyl Floor Covering.

J. ASTM F1344 - Specification for Rubber Floor Tile.

K. ASTM F1869 – Test method for moisture content.

L. FS RR-T-650 - Treads, Metallic and Non-metallic, Non-skid.

M. FS SS-T-312b - Tile, Floor: Asphalt, Rubber, Vinyl, Vinyl Composition.

Bid Set - Not For Construction 3/11/2019

N. ASTM F1861 - Wall Base: Rubber and Vinyl Plastic.

O. NFPA 258 – Recommended Practice for Determining Smoke Generation of Solid Materials.

P. Calcuim Chloride Test developed by the Rubber Manufacturer's Association.

1.4 REGULATORY REQUIREMENTS

A. Resilient flooring shall comply with the following fire performance characteristics as determined by testing products per ASTM test method indicated below:

1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E648.

2. Smoke Density: Less than 450 per ASTM E662.

B. Products supplied for tile installation shall comply with local regulations controlling use of volatile organic compounds (VOC).

C. Resilient flooring products shall have a minimum coefficient of friction when tested according to ASTM D2047 of 0.60 for flat floors and 0.80 for ramped surfaces.

D. Conform to CCR, Title 24, Part 2, and ADAAG for access for the disabled.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit (5) 3-inch square Samples illustrating color and pattern for each floor material specified.

C. Submit (5) 2-inch long Samples of base and stair material for each material specified.

D. Submit two copies of calcium chloride tests with manufacturer's acceptance of concrete slab as substrate.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Section 01 74 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Concrete subfloor shall be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

C. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

D. Subfloor Moisture Conditions: Moisture emission rate of both new and existing floors of no more than 3 lb/1000 sq. ft./24 hours when tested by ASTM F1869 with subfloor temperature not less than 65 degrees Fahrenheit in the presence of the Inspector of Record.

E. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.

F. Provide Moisture Vapor Emission Control system Per Specification Section 09 05 61 at all existing concrete slab locations to receive new resilient flooring.

1.8 WARRANTY FOR MOISTURE, VAPOR, AND/OR ALKALINITY MITIGATION

A. System shall carry a minimum 10-year warranty for both labor and finish materials if subsequent flooring material failure is due to slab substrate generated emission and/or alkalinity. No exclusions for moisture vapor emission changes that occur at a later date from that of control system testing are allowed.

B. System shall be compatible with all floor finished and adhesives.

C. Systems shall deeply penetrate and seal the substrate and provide a smooth surface suitable to accept new floor finish material.

D. System shall be three-component consisting of a penetrating sealer, a primer and a polymerized topcoat and shall be approved by the applicator of the finish floor surface.

1.9 EXTRA MATERIALS

A. Provide 100 square feet of flooring and 100 lineal feet of base and stair materials of each material specified under provisions of Section 01 77 00.

PART 2 – PRODUCTS

A. Linoleum Tile
1. Forbo Marmoleum Dual Tile; color: (TBD).

2. Approved equal, if performance and quality equivalency can be evidenced.

3. Refer to Construction Documents.

B. Vinyl Composite Tile
1. Manufacturers: Armstrong World Industries, Mannington Commercial, or approved equal.

2. Vinyl Composition Tile: ASTM F1066, Composition 1, Class 2; 12 inch x 12 inch size, 1/8 inch thick.

3. Pattern: Equivalent to [“Standard Excelon Imperial Texture”] [“Multicolor”]as manufactured by Armstrong, to be selected by Architect from manufacturer’s entire range.

4. Feature Strips: Of same material as tile; 2 inches wide.

2.2 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Cast Underlayment per Specification Section 03 54 16.

C. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

D. Edge Strips: Vinyl type, color as selected by Architect.

E. Sealer and Wax: Types recommended by flooring manufacturer.

F. Welding Rods for Linoleum Flooring: Color matched welding rod.

2.3 RESILIENT TOP-SET BASE

A. Manufacturers: Armstrong World Industries, BurkeMercer, Roppe Corporation, or approved equal.

B. Resilient Top-Set Base: ASTM F1861, rubber; Style B coved; 4 inches high; 0.125 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that concrete slabs comply with ASTM F710.

B. Verify concrete floors exhibit acceptable moisture emission rate; exhibit negative alkalinity, carbonization, or dusting.

C. Verify that surfaces are smooth and flat and are ready to receive Work.

D. Perform calcium chloride test.

E. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

C. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to concrete slab surfaces if recommended by flooring manufacturer.

3.3 INSTALLATION - TILE AND SHEET MATERIAL

A. Install in accordance with manufacturers' instructions.

B. Mix tile from container to ensure shade variations are consistent.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place; press with heavy roller to attain full adhesion.

E. Install tile to square grid pattern with all joints aligned and to pattern indicated on drawings.

F. Pattern grain parallel for all units and parallel to width of room. Allow minimum 1/2 full size tile width at room or area perimeter.

G. Lay flooring with seams parallel to length of room to produce minimum number of seams. Provide minimum of 1/3 full roll width. Double cut sheet and continuously heat weld seams.

H. Terminate flooring and provide rubber edge strip at centerline of door openings where adjacent floor finish is dissimilar.

I. Install edge strips at unprotected or exposed edges, and where flooring terminates.

J. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

K. Install flooring in pan type floor access covers. Maintain floor pattern.

L. Install flooring under movable partitions and under cabinetry without interrupting floor pattern.

M. Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

N. Allow for 25 percent accent color pattern unless noted otherwise.

O. Heat weld all seams of sheet flooring.

3.4 INSTALLATION - BASE MATERIAL

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners.

C. Field wrap external corners with longest practical lengths. "V" cut back surface to 2/3 its thickness.

D. Install base on solid backing. Bond tight to wall and floor surfaces.

E. Scribe and fit to door frames and other interruptions.

F. Install base at casework where occurs in rooms scheduled for rubber base.

G. Install integral coved base in flash-coved method. Install cap trim at top of base where edge of flooring is exposed. Install radiused backing fillet at wall and floor juncture. Heat weld all seams.

3.5 INSTALLATION - STAIR COVERING MATERIALS

A. Install stair treads, one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.6 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

3.7 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

C. At the very minimum, four layers of wax shall be applied, sufficient to fully seal the floor surface to a smooth lustrous finish and to completely fill all joints and any voids or cracks between tiles.

D. The finished floor, completely waxed, shall be reviewed by the Owner and deemed satisfactory. If, in the opinion of the Owner, additional coats are required, the Contractor shall apply these at no expense to the Owner.

E. Refer to Specification Section 01 74 00 for additional requirements.

END OF SECTION

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SECTION 09 68 00
CARPET

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Carpeting tile.

B. Interior walk-off mats.

C. Accessories for carpet.

D. Installation.

1.2 REFERENCES

A. ASTM D1335 - Tuft Bind of Pile Floor Coverings.

B. ASTM E648 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

C. ASTM E662 - Specific Optical Density of Smoke Generated by Solid Materials.

D. CCR - California Code of Regulations, Title 24, Part 9, Appendix IV-A.

E. CRI 104 - Carpet and Rug Institute Standard for Installation of Commercial Textile Floorcovering Materials.

F. NFPA - National Fire Protection Association.

G. FCIB - Floor Covering Installation Board.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data for specified products, describing physical characteristics, sizes, patterns, colors available, and method of installation.

C. Submit two Samples 12 inches x 12 inches in size, illustrating color and pattern for each carpet material specified.

D. Shop Drawings showing the extent of carpet, direction of carpet, and accessories shall be submitted to Architect for approval prior to installation. Should also indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet. Copy of approved shop drawings to be available on job site during installation.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit maintenance data under provisions of Section 01 70 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning and shampooing.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications.

1. Perform Work in accordance with CRI 104.

2. Maintain one copy of document CRI 104 on site.

3. Manufacturer: Company specializing in carpet manufacturing with ten years minimum experience.

4. Installer: FCIB certified or with demonstrated ability to comply with FCIB certification procedures.

5. Carpet shall have an average tuft bind of 20 pounds when tested in accordance with ASTM D1335.

6. Carpet shall bear CRI Indoor Air Quality Carpet Testing Program label.

7. Upon request, manufacturer to provide representative to assist in project start-up and to inspect installation while in process and upon completion. Representative will notify designated contact if any installation instructions are not followed.

B. Installer Qualifications.

1. Flooring contractor must be certified by the carpet manufacturer prior to bid.
2. Flooring contractor to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.

3. Certify payment of Prevailing Wage Rates to the installers.

4. Flooring contractor possessing Contract for the carpet installation shall not subcontract the labor without written approval of the Project Manager.

5. Flooring contractor will be responsible for proper product installation, including floor testing and preparation as specified by the carpet manufacturer.

6. Flooring contractor to provide Owner a written installation warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of one year after job completion.

1.6 REGULATORY REQUIREMENTS

A. Conform to CCR, Title 24, Part 9, Appendix IV-A for Class 1 floor finish flammability requirements.

B. Floor covering shall have a NFPA Class I rating with a minimum radiant flux of 0.45 watt per square centimeter when tested in accordance with ASTM E648.

C. Floor covering shall have a smoke developed rating of less than 450 when tested in accordance with ASTM C662.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and protect products under provisions of Section 01 87 00.

1.8 PROJECT/SITE CONDITIONS

A. Comply with requirements of CRI 104.

B. Concrete subfloor to be allowed to cure for a minimum of 90 days to achieve acceptable dryness.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

D. Maintain minimum 70 degrees Fahrenheit and maximum 95 degrees Fahrenheit ambient temperature with relative humidity between 10 and 65 percent three days prior to, during, and after installation of materials.

E. Subfloor Moisture Conditions: Moisture emission rate equal to or less than 3 pounds/1000 square feet/24 hours when tested by calcium chloride moisture test in compliance with CRI 104, Section 6.2.1, with subfloor temperature not less than 65 degrees Fahrenheit.

F. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and test paper is applied.

G. All material used in sub-floor preparation and repair shall be recommended by the carpet manufacturer and shall be chemically and physically compatible with the carpet system being bid.

H. Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

I. Prepare all existing concrete slabs with Water Vapor Control Barrier prior to installation. See Specification Section 09 05 61 Moisture Vapor Emission Control.

1.9 WARRANTY

A. Provide under provisions of Section 01 70 00.

B. Performance Warranty: Manufacturer's lifetime warranty covering delamination of secondary backing, edge ravel and tuft bind of carpet under both wet and dry conditions.

C. Wear Warranty: Manufacturer's lifetime warranty that carpet will lose no more than 10 percent by weight of face yarn.

D. Warranty to be sole source responsibility of the Manufacturer. Second source warranties and warranties that involve parties other than the carpet manufacturer are unacceptable.

E. If the product fails to perform as warranted when properly installed and maintained, the affected area will be repaired or replaced at the discretion of the Manufacturer.

F. The non-prorated (25) twenty-five year warranty shall specifically warrant against:

1. Excessive Surface Wear: More than 15% loss of pile fiber weight.

2. Excessive Static Electricity: More than 3.0 kV per AATCC 134.

3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency.

4. Delamination.

5. Edge Ravel.

6. Zippering.

G. Provide certification and warranty that product is fully or partially recyclable through manufacturer's or aligned partner's recycling program. Include information regarding what portions of the product will be recycled into other recyclable/non-recyclable products, down-cycled, land filled, and/or incinerated.

1.10 EXTRA MATERIALS

A. Provide 60 square feet of carpeting of each color specified, under provisions of Section 01 70 00. Product to be boxed. Coordinate storage location with Owner.

PART 2 - PRODUCTS

2.1 SLAB PREPARATION / MITIGATION

1. Per Specification Section 07 26 40 Moisture Vapor Emission Control.

2.2 CARPET MANUFACTURERS

A. Premium Grade Carpet Tile

1. Shaw, Style: Spectrum #59584.

2. Interface, Style: Entropy.

3. Collins and Aikman / Tandus Company

B. Walk-Off Floor Mat

1. Tandus Flooring “abrasive action 02578”

2. Forbo Flooring “Coral Brush Activ”

C.

B. Substitutions: Under provisions of Section 01 62 00.

2.3 MATERIALS

A. Tufted or woven carpet conforming to published specification characteristics of named manufacturer.

B. Fiber type shall be Solution Q Extreme, Type 6, 100% Solution Dyed.

C. Carpet shall contain a minimum of 12 percent post-consumer recycled content, total recycled content minimum 35%.

2.4 FIBER

A. Nylon Fiber: Solution Q Extreme, Type 6, 100% Solution Dyed.

B. Mill-extruded fibers are not allowed.

C. Blends of Solutia fibers are not allowed. Solutia LXI fibers alone are not allowed.

D. Durable stain inhibitor should be applied to the fiber during product manufacturing to resist fiber staining and soiling. Minimum average of three fluorine analyses of a single composite sample per CRI TM-102: 500 ppm.

E. Fiber to contain carbon-core filament for permanent static control. Topical treatments not allowed.

F. 100% cradle to cradle recyclable.

2.5 BACKING CHARACTERISTICS

A. Primary Backing: Synthetic Non-Woven.

B. Secondary Backing: Eco Worx.

1. 100% Thermoplastic polyolefin composite with a high performance precoat and a reinforcing layer.

2. Impermeable to moisture and airflow.

3. 24” x 24”.

4. Lifetime commercial limited warranty. PVC free, 100% cradle to cradle recyclable.

C. Product to be installed with Shaw sunset N5000 releasable adhesive or Eco Worx ES, Shaw’s self-adhesive system to securely attach product to sub-floor in compliance with ADA guidelines if available from Manufacturer.

2.6 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by carpet manufacturer.

B. Adhesives: Products to be supplied with a pre-cured, mill-applied or other "dry" adhesive system (2.02E) when available. Otherwise, adhesive should be full spread, extremely low VOC in compliance with CRI Indoor Air Quality Adhesive Testing Program requirements, compatible with materials being adhered, as recommended by the Manufacturer.

C. Base, Carpet Edge, and Transition Strips: As specified in applicable sections.

2.7 RECYCLING PROGRAM

A. Manufacturer must have a collection and recovery system for product and a fully established, currently operational recycling program at time of bid per FTC guides Section 260.7 (d).

B. Manufacturer must be able to reclaim and recycle 100% of existing carpet of similar composition back into carpet at time of bid.

C. Manufacturer must have product a take back program and be able to reclaim and recycle 100% of installed product back into carpet at the end of its service life at time of bid. Claiming a product is recyclable based on future expectation of technology, equipment, process or availability of that product as feed stock is not acceptable. Recycling process must be available for verification.

D. Collection and recycling program must be verified by an independent, neutral third-party organization, such as Scientific Certification Systems.

E. Manufacturer must have written guarantee that 100% of the recovered product will be recycled and that no portion of the product will be land filled or incinerated (including waste-to-energy).

2.8 ENVIRONMENTALLY PREFERABLE PRODUCT

A. Carpet must be certified as an Environmentally Preferable Product (EPP) by a neutral, independent, third party organization such as Scientific Certification Systems. Carpets must carry an EPP carpet label certifying its Environmental

Preferability. Products carrying EPP carpet labels will be given higher preference than those carrying only an EPP fiber label.

2.9 INDOOR AIR QUALITY

A. Product must have low VOC adhesive.

B. Product, inclusive of floor covering adhesive, must meet CRI's IAQ requirements for carpet only. Environmental chamber testing per ASTM D-51 16. Emission Rates determined at 24 hours. Product, inclusive of pre-applied adhesive must off gas less than:

0.5 mglsq. meter per hour of Total Volatile Organic Compound (TVOC);
0.05 mglsq. meter per hour of formaldehyde;
0.4 mglsq. meter per hour of styrene; and
0.05 mglsq. meter per hour of 4-Phenyl Cyclohexene (4-PC)

1. Submit Indoor Air Quality report showing CRI Green label Certification Number for carpet (inclusive of adhesive). If results for carpet testing are not inclusive of adhesive, submit separate IAQ test reports for carpet and adhesive.

2. Indoor air quality results of the product installed must be same as those specified by the Project requirements.

3. Additionally, product, inclusive of adhesive, must meet the requirements of the State of Washington Indoor Air Quality Specifications for Carpet at 24 hours. Environmental chamber testing per ASTM D-5116. Product must not require the 30-day air out period that the State of Washington protocol allows.

2.10 PERFORMANCE CHARACTERISTICS

A. Test reports for the following performance assurance testing to be submitted upon request. Submitted results shall represent average results for production goods of the referenced style.

B. Requirements listed below must be met by all products.

1. Flooring Radiant Panel: ASTM E-648 / NFPA 253: Class 1 (CRF: 0.45 wattslsq cm or greater).

2. Federal Flammability: CPSC FF 1-70: Passes.

3. Smoke Density: ASTM E-662 1 NFPA 258: 450 Flaming Mode.

4. Electrostatic Propensity: AATCC 134 (Step & Scuff): 3.0 kV or less.

5. Static Coefficient of Friction: ASTM C-1028: Passes ADA Guidelines for Accessible Routes (Minimum 0.60). Slip Resistant.

6. Delamination of Secondary Backing of Pile Floor Coverings: ASTM D-3936: No Delamination.

7. Lightfastness: AATCC 1 6E: 2 4 @ 1 00 hours.

8. Vetterman Drum: ASTM D-5417: Minimum 3 @ 22,000 cycles.

9. Moisture Barrier: Moisture Penetration by Impact @ 10 psi: No Penetration of backing and seam after 10,000 impacts.

10. Air Flow Barrier: Air Permeability of Textile Fabrics: No Air Flow (0.0 ft3/min) through backing and seam.

11. Seam Integrity: Seam to remain intact after 50,000 cycles per Phillips Chair Test.

2.11 MANUFACTURING SPECIFICATIONS

A. CPT-1 - Manufactured by Shaw Contract Group, No Rules Collection,

Style: Spectrum # 59584

Construction	Multi-level Pattern Loop
Gauge	1/12”
Stitches per inch	8.0
Finished Pile Thickness	.115
Average Density	6,261 oz/yd 3
Fiber System	Solution Q Extreme, Type 6 - Cationic Nylon, 100% Solution Dyed
Product Size	24” x 24”
Primary Backing	Polyolefin Composite
Secondary Backing	Eco Worx
Tufted Yarn Weight	20.0 oz/sq yd.
Protective Treatments	Inherent stain resistance, SSP Shaw Soil Protection
Average Density	6261
Total Thickness	0.245
Electrostatic Propensity	3.0 K.V. or lower
Radiant Panel	(ASTM E 628) Class 1
NMS Smoke	(ASTM E 662) less than 450
Electrostatic Propensity	(AATCC 134) less than 3.5kv, built-in
Flooring Radiant Panel Test	Mean average critical radiant flux: 0.45 wlsq cm or higher
Smoke Density	Flaming: Mean average: 450 or lower

Flammability	Passes
Warranties	Lifetime commercial, non prorated limited warranty against excessive surface wear & static, delamination, edge ravel, static, zippering.

B. MAT-1 Manufactured by Tandus Centiva, ,Jhane Barnes Collection Style #: 02578, Abrasive Action II

Construction	Accuweave® Patterned Loop
Gauge	1/12"
Electrostatic Propensity	1.5 kV (AATCC 134); Permanent Conductive Fiber
Fiber System	TDX Nylon
Pattern	Texture 4.7mm rib
Soil Protection	Application rate: 2% of face weight
Pile Thickness	0.187inches
Dye Method	100% Solution Dyed
Coefficient of Friction	0.8
Colorfast to Light	>4 after 100 hours (AATCC 16E)
Product Size	24 x 24
Primary Backing	Non-woven synthetic fiber
Protective Treatments	Fluorine-Free Soil Protection Eco-Ensure
Radiant Panel	(ASTM E 648) Class 1
NBS Smoke Density	(ASTM E 662) less than 450

C. Substitutes/Alternates: Subject to compliance with all requirements, "or equal" must match the selected color(s) and have similar aesthetic appearance and tuft density, closed-cell vinyl cushion backing (2.02D) and "dry" adhesive system (if available) to fully attach carpet product to subfloor (2.02E).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine subfloors and conditions for compliance with requirements for moisture content, alkalinity range and other conditions affecting performance of carpet.

B. Verify that subfloor surfaces are smooth and flat and are ready to receive Work.

C. Beginning of installation means acceptance of subfloor and site conditions.

3.2 PREPARATION

A. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

B. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to leave smooth, flat, hard surface.

D. Prohibit traffic until filler is cured.

E. Apply subfloor primer compatible with adhesive where recommended by carpet manufacturer.

D. Vacuum floor surface.

3.3 INSTALLATION

A. Apply carpet and adhesive in accordance with manufacturer's instructions and CRI 104, Section 8.

B. Verify carpet match before cutting to ensure minimal variation between dye lots.

C. Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true, and unfrayed.

D. Locate seams in area of least traffic.

E. At doorways, center seams under door in closed position.

F. Fit seams straight, not crowded or peaked, free of gaps.

G. Lay carpet on floors with run of pile in same direction as anticipated traffic.

H. Do not change run of pile in any room where carpet is continuous through a wall opening into another room.

I. Locate change of color or pattern between rooms under door centerline.

J. Extend carpet into toe spaces, door reveals, open-bottomed obstructions, alcoves and similar openings.

K. Cut and fit carpet around interruptions.

L. Fit carpet tight to intersection with vertical surfaces without gaps.

3.4 PROTECTION AND CLEANING

A. Remove yarns that protrude from carpet surfaces.

B. Comply with requirements of CRI 104, Section 15.

C. Prohibit traffic from carpet areas for 24 hours after installation.

D. Remove excess adhesive and/or seam sealer from floor, base and wall surfaces without damage.

E. All rubbish, wrappings, debris, trimmings, etc. to be removed from site and disposed of properly.

F. Clean and vacuum carpet surfaces using a beater brush bar commercial vacuum.

G. After each area of carpet is installed, protect from soiling and damage by other trades.

END OF SECTION

SECTION 09 90 00
PAINTS AND COATINGS FOR STANDING SEAM METAL ROOF

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and field painting of existing standing seam metal roof system.

1.2 RELATED SECTIONS

NA

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

B. Steel Structures Painting Council (SSPC) SP6 - Commercial Blast Cleaning Procedures.

C. Steel Structures Painting Council (SSPC) SP10 - Near White Blast Cleaning Procedure.

1.4 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16.
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85 degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60 degree meter.
   3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60 degree meter.
   4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60 degree meter.

B. Environments: The following terms distinguish between different corrosive exposures:

   1. "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.
   2. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.
   3. "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes

and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: For each paint system indicated, including:

1. Material List: An inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Preparation instructions and recommendations.
3. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label:

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F (7 degrees C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Basis of Design: The Garland Company. 3800 E. 91st Street. Cleveland, OH 44105. 415 971 2739. Web: www.garlandco.com or approved equal.
1. Existing metal roof warranty held by The Garland Company.

B. Substitutions per Division 1 General Requirements.

2.2. PAINT MATERIALS - GENERAL

A. Material Compatibility: Primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that meet the applicable local, state, or federal VOC requirements.

C. Color: Eggplant. (DE5944).

2.3. EXTERIOR PAINT SYSTEMS

A. Ferrous Metals: Provide the following systems over exterior coated metal surfaces.

B. Paint System:

1. Primer: R-mer Coat PVDF Primer.
2. Finish: R-mer Coat Top Coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
2. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
   a. Confirmation of primer's suitability for expected service conditions.
   b. Confirmation of primer's ability to be top coated with materials specified.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
   1. Power wash roof with water and TSP.
   2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
   2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
   3. Do not thin material.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Air or HVLP spray application preferred. Use of alternative application methods may result in unacceptable appearance. DeVilbiss MBC gun, 704 or 777, air cap with “F” tip and needle or equivalent. Atomizing pressure 55-70 psi. Spray equipment must be handled with due care and in accordance with manufacturer’s recommendation.

C. General: Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques best suited for the material being applied.
2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
3. Coating surface treatments, and finishes are indicated in the coating system descriptions.
4. Provide finish coats compatible with primers used.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

D. Application Procedures: Apply coating by spray only.

1. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.
2. Stir Primer Part A well, then mix Primer Part A into Primer Part B at a ratio of 5:1 by volume. After both component have been incorporated, HG Primer has a pot life of 4 hours. Spray combined mixture at a coverage rate of 5 wet mils, or 300 square feet per gallon.
3. Once Primer has cured fully (approximately 4 hours at 77° F), mix Part A into Part B at a ratio of 10:1 by volume, and apply at a coverage rate of 5 wet mils, or 300 square feet per gallon. After both components have been incorporated into one another, R-mer Coat has a pot life of 2 hours (at 77° F). Once applied, R-mer Coat will cure fully in 24 hours (at 77° F).
   a. Apply two coats.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Part A: Water

B. Part A and B mixed: Water followed by Acetone

C. Primer: Water/Isopropanol mixture

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Products and application.

C. Surface finish schedule.

D. Patch to match existing.

1.2 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D2016 - Test Method for Moisture Content of Wood.

1.3 SYSTEM DESCRIPTION

A. Preparation of all surfaces to receive final finish.

B. Painting and finishing Work of this Section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.

D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical Work on site, in building spaces, and above or on the roof.

E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

1.4 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.

B. Applicator: Company specializing in commercial painting and finishing with five years documented experience.

C. Regulatory Requirements: Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

D. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.

E. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.

F. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.

C. List each material by catalog number and cross-reference specific coating with specified finish system.

D. Provide manufacturer's certification that products proposed meet or exceed specified materials.

E. Submit two 8-1/2 inch x 11 inch Samples of each paint color and texture applied to cardboard. Resubmit Samples until acceptable color, sheen and texture is obtained.

F. On same species and quality of wood to be installed, submit two 4 x 8 inch Samples showing system to be used.

1.7 FIELD SAMPLES

A. Provide field samples under provisions of Section 01 33 00.

B. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 square feet of surface area.

C. Provide full-coat finishes until required coverage, sheen, color and texture are obtained.

D. Simulate finished lighting conditions for review of field samples.

E. After finishes are accepted, the accepted surface may remain as part of the Work and will be used to evaluate subsequent coating systems applications of a similar nature.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver the products to site and store and protect under provisions of Section 01 87 00.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Urethane Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 feet candles measured mid-height at substrate surface.

1.10 EXTRA STOCK

A. Provide a two gallon containers of each finish paint color to Owner for touchup.

B. Label each container with color, texture, and room locations in addition to the manufacturer's label.

1.11 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Unless specifically identified otherwise, product designations are those of the Dunn-Edwards Corporation, and shall serve as the standard for kind, quality, and function.

B. The listed paint manufacturer is the District's sole approved manufacturer. No substitutions.

2.2 MATERIALS

A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shella, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

D. All paints to be low VOC Acrylic and Ethylene Glycol free.

2.3 FINISHES

A. Refer to schedule at end of Section for surface finish schedule.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.

B. Examine surfaces to be finished prior to commencement of Work. Report any condition that may potentially affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.

4. Exterior Located Wood: 15 percent, measured in accordance with ASTM D2016.

D. Beginning of installation means acceptance of existing surfaces.

3.2 SURFACE PREPARATION

A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

B. Correct minor defects and clean surfaces which affect Work of this Section.

C. Shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

G. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

H. Gypsum Board: Repair all voids, nicks, cracks and dents with patching materials and finish flush with adjacent surface. Latex fill minor defects. Spot prime defects after repair.

I. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Pretreat with phosphoric acid etch or vinyl wash. Apply coat of etching primer the same day as pretreatment is applied.

J. Concrete and Unit Masonry: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

K. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

L. Uncoated Steel and Iron: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

M. Shop Primed Steel: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

N. Interior Wood: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

O. Exterior Wood: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

P. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

Q. Wood Doors: Seal top and bottom edges with 2 coats of spar varnish sealer.

3.3 PROTECTION OF ADJACENT WORK

A. Protect elements surrounding the Work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by Work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.4 WORK NOT TO BE PAINTED

A. Painting is not required on surfaces in concealed and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.

B. Do not paint metal surfaces such as stainless steel, chromium plate, brass, bronze, and similar finished metal surfaces.

C. Do not paint anodized aluminum or other surfaces which are specified to be factory pre-finished.

D. Do not paint sandblasted or architecturally finished concrete surfaces.

E. Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or identifications.

3.5 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand lightly between coats to achieve required finish.

F. Allow applied coat to dry before next coat is applied.

G. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Prime back surfaces of interior and exterior woodwork with primer paint.

J. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

K. Paint mill finished door seals to match door or frame.

L. Paint primed steel glazing stops in doors to match door or frame.

M. Cloudiness, spotting, lap marks, brush marks, runs, sags, spikes and other surface imperfections will not be acceptable.

N. Where spray application is used, apply each coat of the required thickness. Do not double back to build up film thickness of two coats in one pass.

O. Where roller application is used, roll and redistribute paint to an even and fine texture. Leave no evidence of roller laps, irregularity of texture, skid marks, or other surface imperfections.

P. For painting of exterior patchwork, paint to the nearest surface break.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment. Do not paint shop prefinished items.

B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

D. Replace identification markings on mechanical or electrical equipment when painted accidentally.

E. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

F. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

G. Paint grilles, registers, and diffusers which do not match color of adjacent surface.

H. Paint all mechanical and electrical equipment, vents, fans, and the like occurring on roof.

I. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts.

J. Do not paint over labels or equipment identification markings.

K. Do not paint mechanical room specialties such as compressors, boilers, pumps, control panels, etc.

L. Do not paint switch plates, light fixtures, and fixture lenses.

3.7 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.8 PROTECTION OF COMPLETED WORK

A. Protect finished installation under provisions of Section 01 87 00.

B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.

C. Confirm that no dust generating activities will occur following application of coatings.

3.9 PATCHING

A. After completion of painting in any one room or area, repair surfaces damaged by other trades.

B. Touch-up or re-finish as required to produce intended appearance.

3.10 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of DIVISION 00 and DIVISION 01.

B. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary.

C. The Owner will engage the services of an independent testing agency to sample paint material being used.

D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.

E. The testing agency will perform appropriate quantitive materials analysis and other characteristic testing of materials as required by the Owner.

F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing and repaint surfaces to acceptable condition.

3.11 COLOR SCHEDULE

A. Paint and finish colors shall be custom color, mixed and formulated to match existing finishes.

B. Access doors, registers, exposed piping, electrical conduit and mechanical/electrical panels if not stainless steel; generally the same color as adjacent walls.

C. Exterior and interior steel doors, frames and trim; match adjacent existing door frames.

D. Doors: Match adjacent existing door paint or varnish.

E. Interior and Exterior Steel Fabrications, if not Stainless Steel: Match existing or adjacent walls.

3.12 SCHEDULE - EXTERIOR SURFACES

A. The following paint systems shall be used:

1. Wood-Painted (Velvet Acrylic) - Exterior Base

1st coat:	UGPR00 Ultra-grip Premium
2nd coat:	SSHL20 Spartashield
3rd coat:	SSHL20 Spartashield

2. Wood-Painted (Semi-Gloss Acrylic) – Exterior Trim

1st coat:	UGPR00 Ultra-grip Premium
2nd coat:	EVSH50 Evershield
3rd coat:	EVSH50 Evershield

3. Metal Painted (Velvet Acrylic) – Exterior Base

1st coat	GAPR00 Galv-Alum Premium
2nd coat	SSHL20 Spartashield
3rd coat	SSHL20 Spartashield

4. Metal Painted (Semi-Gloss Acrylic) – Exterior Trim

1st coat	GAPR00 Galv-Alum Premium
2nd coat	EVSH50 Evershield
3rd coat	EVSH50 Evershield

5. Masonry Painted (Velvet Acrylic) – Exterior Base

1st coat	EFF-Stop Premium
2nd coat	SSHL20 Spartashield
3rd coat	SSHL20 Spartashield

6. Masonry Painted (Semi-Gloss Acrylic) – Exterior Trim

1st coat	EFF-Stop Premium
2nd coat	EVSH50 Evershield
3rd coat	EVSH50 Evershield

3.13 SCHEDULE - INTERIOR SURFACES

A. The following paint systems shall be used:

1. Interior Painted Surfaces (Semi-Gloss Alkyd) - Interior Base

1st coat:	UGPR00 Ultra-grip
2nd coat:	SPMA50 Suprema
3rd coat:	SPMA50 Suprema

2. Interior Painted Surfaces (Gloss Alkyd) – Interior Trim

1st coat:	UGPR00 Ultra-grip
2nd coat:	SPMA50 Suprema
3rd coat:	SPMA50 Suprema

END OF SECTION 09 91 00

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Door and wall signage.

B. Traffic Signs.

1.2 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Submit dimensioned elevations of each sign configuration.

1. Show sign sections indicating materials, thicknesses and attachment methods.

2. Show anchors and reinforcement.

3. Provide complete signage schedule indicating all signs and locations, key to room numbers and elevations. Provide space for Architect to indicate sign type and location.

C. Product Data:

1. Manufacturer's current published specifications.

2. Manufacturer's installation instructions.

D. Samples:

1. Provide two Samples of each sign type required in the profiles and sizes indicated on the Drawings. Signs approved with correct color and type may be used in the final installation at the request of the Contractor.

2. Provide Samples of all proposed fasteners and accessories.

3. Three copies of manufacturer’s color chart indicating all available standard colors for selection by the Architect.

E. Closeout: Manufacturer's warranty.

1.3 PROJECT CONDITIONS

A. Environmental Requirements: Install signs only when interior air and substrates have reached equilibrium moisture and temperature approximating that of normal occupied conditions.

1.4 REGULATORY REQUIREMENTS

A. Conform to C.C.R., Title 24, Part 2, Chapter 11, ADA Accessibility Guidelines (ADAAG), and American Disability Act (ADA) for accessibility requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver signs safely packed to prevent damage during shipment and prior to installation.

B. Keep signs in protective wrapping until ready for installation.

C. Handle carefully to prevent damage. Replace damaged parts at no cost to the Owner.

D. Comply with the additional requirements specified in Section 01 87 00.

1.6 SCHEDULING

A. Do not install signs until walls and/or doors have received final finish.

1.7 WARRANTY

A. Procedures: In accordance with Section 01 70 00.

B. Furnish manufacturer's written warranty agreeing to replace signs which fade or discolor under normal environmental exposure.

C. Warranty Period: 5 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements specified herein.
B. Substitutions: Under provisions of DIVISION 1

2.2 DOOR AND WALL SIGNAGE

A. Cast Acrylic Sheet: ASI Modulux, Mohawk Sign Systems Inc., or approved equal.

1. Monolithic tactile plaque sign with fully integrated graphics composed of high-impact polyester acrylate resins, pressure molded into a single polymerized component, using manufacturer’s co-molding process.

a. Depth: 0.25 inch thickness.

b. Panel Appearance: Specify from manufacturer’s standard, high contrast semi-matte color chart.

c. Surface Texture: Matte non-glare.

d. Letter Styles and Sizes and Layout Position: Specify from manufacturer's standard letter styles and color chart.

e. Text Schedule: Verify correct capitalization.

f. Sign Size: As indicated on the Drawings.

g. Sign Shape: As indicated on the Drawings. Square or rectangular shapes shall have radiused corners.

h. Installation: Provide countersunk mounting holes for mechanical fasteners.

i. Sign Copy: Shall be integrally molded with sign body per manufacturer's standard bonding process.

j. Application: Rated for exterior and interior applications.

k. Background Appearance: Solid color from manufacturer's standard color charts.

l. Braille: Integral domed-shaped California Grade 2 Braille dots, each distinct and separate.

2. Flame Resistance: Application of a lighted match shall not produce melting, flashing, flaring or distortion. Signs shall not ignite at a temperature less than 800º F.

3. Vandal resistant surface which can be cleaned using industrial cleansers, including acetone.

B. Fasteners: All screws, bolts and fasteners to be tamper resistant stainless steel. All fasteners to be to be provided with solid anchorage to studs, blocking or concrete; do not use toggle bolts.

C. Colors: High contrast semi-matte integral colors for graphics. All integral resins are U.V stabilized resins utilizing automotive grade pigments.

D. Location of signs as shown on Drawings.

2.3 TRAFFIC SIGNS (EXTERIOR INFORMATION AND WAYFINDING)

A. Manufacturer: Hawkins Sign Co, Inc. (510) 525-8500; Traffic Control Service Inc., (800) 884-8274; or approved equal.

B. Types of Signs: Sheet metal with porcelain enamel finish.

1. Accessible Directional Signs: Complying with Title 24, Part 2, Section 11B Division 2 and Division 7. . Text on signs shall comply with ADAAG Section 4.3 and 4.30.

C. Sign Posts: 2-inch outside diameter standard weight galvanized steel pipe, set in concrete footing.

D. Mount signs on sign posts with bottom of sign 7 feet 2 inches above grade, unless indicated otherwise.

2.8 FABRICATION

A. General Requirements:

1. Shop-fabricate signs to requirements indicated for materials, thicknesses, designs, shapes, sizes and details of construction.

2. Sign panel surfaces shall be smooth, even and fabricated to remain flat under installed conditions. Ease all edges and corners of signs.

3. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant regulations and requirements indicated for size, style, spacing, content, position and colors.

B. Tactile Graphics and Text:

1. Conform to C.B.C. Title 24, Chapter 11, Section 11B-Division 7. 11B-703.2.5, Table 11B-703.3.1, 11B-703.3.1 11B-703.3.2.

2. California Grade 2 Braille must accompany raised text characters. Provide tactile copy and Grade 2 Braille raised 1/32 inch minimum from plaque using manufacturer's co-molding process:

a. Letters and numbers shall be raised 1/32 inch (0.794 mm) and shall be sans-serif uppercase characters accompanied by California Grade 2 Braille symbols.

b. Braille Symbols: Rounded or domed California Braille dots, each distinct and separate. Dots shall be 1/10 inch (2.54 mm) on centers in each cell with 2/10 inch (5.08 mm) space between cells. Dots shall be raised a minimum of 1/32 inch (0.794 mm) from a plaque surface.

c. Proportions: Characters shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I".

d. Character Height: Characters and numbers on signs shall be 5/8-inch minimum and 2 inches maximum high and as shown on the Drawings.

e. Contrast of Characters and Symbols: Characters and symbols shall be light characters with dark background with a contrast of 70 percent minimum.

3. Raised Characters and Pictorial Symbol Signs:

a. Letter Type: Letters and numbers on signs shall be raised 1/32 inch (0.794 mm) minimum and shall be sans-serif uppercase characters accompanied by California Grade 2 Braille.

b. The stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character. Reference to CBC 11B Division 7, 11B-703.2.6.

c. Symbol Size: Raised characters or symbols shall be a minimum of 5/8-inch (15.9 mm) and as shown on the Drawings.

d. Pictorial Symbol Signs (Pictograms): Pictorial symbol signs (pictograms) shall be accompanied by the equivalent verbal description placed directly below the pictogram as shown on the Drawings.

e. Contrast between letters and/or characters and background color must be 70 percent minimum.

C. Silkscreening: All silkscreened graphics shall be produced with ABS paint compatible with the substrate, using mesh of 390 or finer to produce clean, sharp edges. All media are to be opaque, with full even coverage, and free from dust bubbles, blemishes and other foreign matter. Characters and symbols shall contrast 70 percent minimum with their background. Characters shall be light colors with dark background.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces to receive units are true and plumb. Correct inadequate surfaces before installation of signs.

B. Verify that moisture and temperature levels of substrate and environment have been stabilized and are acceptable prior to proceeding with the Work.

C. Take field measurements prior to shop fabrication where necessary in order to ensure proper fitting of Work.

D. Do not begin Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in locations and at mounting heights indicated on Drawings.

1. Keep perimeter lines straight, plumb, and level.

2. Install within 1/4 inch tolerance vertically and horizontally of intended location and in accordance with manufacturer's recommendations.

3. Install product at heights to conform to C.C.R., Title 24, Part 2 and ADA Accessibility Guidelines (ADAAG).

B. Installation on Walls: Attach securely through finish wall to rigid backing.

C. Installation Method:
1. Install with vandal / tamper- resistant fasteners at exterior wall applications.

2. Install with epoxy attachment at interior and door face applications.

3.3 CLEANING, PROTECTION AND REPAIR

A. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 5 feet.

B. Clean installed products in accordance with manufacturer's instructions prior to District's acceptance.

END OF SECTION 10 14 00

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cast Aluminum Letters.

1.2 SCOPE

A. Furnish letters and hardware necessary to install cast metal letters shown on drawings and herein specified.

1.3 SUBMITTALS

A. Manufacturer's descriptive literature and specifications.

B. Shop Drawings

C. Installation Instructions

1.4 QUALITY ASSURANCE

A. Manufacturer to have a minimum of 20 years experience in manufacturing lettersl.

B. All letters to be manufactured by one manufacturer.

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PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Impact Architectural Signs
26 E Burlington Ave
LaGrange, IL 60525

(708) 469-7178
specifications@impactsigns.com

B. Substitutes: Equal Approved.

2.2 MATERIALS (METAL ALLOYS)

A. Aluminum - #514 aluminum alloy

2.3 FINISHES

A. Aluminum

1. Clear Anodized, sanded return, #514 aluminum alloy.

standards.

2.4 THICKNESS

A. Varies based on letter height between 3/8” and 1 1/2" deep.

2.5 FONT STYLES

A. Select from Manufacturers Standard font list.

2.6 MOUNTING HARDWARE

A. Bottom Rail Mount
B. See drawings.

2.7 FABRICATION

A. Letters shall be made of cast aluminum.
B. Letter shall be Arial Narrow letter style and shall be 10 inches high, as indicated on the drawings.
C. Finish shall be clear anodized, sanded return.
D. Mounting shall be Bottom Rail Mount.

PART 3 - EXECUTION

3.1 INSTALLATION

A. A qualified installer shall install cast metal letters.

B. Install signs level, plumb, and at the height indicated with sign surface free from distortion or other defects in appearance.

3.3 WARRANTY

A. Letters should be guaranteed for the life of the school against defect
.

END OF SECTION

SECTION 10 21 13
PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid phenolic toilet partitions and sight screens, floor mounted, headrail braced.

B. Additional cross-bracing as required.

C. Hardware: Coordinate with items installed under Section 10 28 00 - Toilet and Bath Accessories.

D. Attachments, screws and bolts.

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CCR - California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM E84 - Test Method of Surface Burning Characteristics of Building Materials.

E. NEMA LD-3 - High Pressure Decorative Laminates.

F. NFPA 286-Standard Methods for Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Submit Product Data for components, hardware, and accessories.

C. Submit three Samples 4 inch x 4 inch in size, cut from actual panel construction, illustrating panel pattern.

D. Provide a Sample of each type of hardware.

E. Submit manufacturer's installation instructions.

1.4 REGULATORY REQUIREMENTS

A. Conform to CCR, Title 24, Part 2, and ADAAG for accessibility requirements.

B. Class B rating to conform to flame spread and smoke developed ratings of 20/95 for panel materials when tested in accordance with ASTM E84.

1.5 COORDINATION

A. Coordinate Work under provisions of DIVISION 1.

B. Coordinate Work with support framing and anchors.

C. Coordinate Work with placement of plumbing fixtures and floor drains.

D. Coordinate Work with placement of electrical fixtures and equipment.

E. Coordinate Work with toilet accessories.

1.6 WARRANTY

A. Provide 10 year limited warranty under provisions of Section 01 70 00.

B. Warranty shall provide for coverage of solid phenolic panels, doors and stiles against breakage, corrosion and delamination.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bobrick Washroom Equipment Inc. as standard of quality.

B. Substitutions: Under provisions of Section 01 62 00.

2.2 PRODUCT

A. 'DuraLine Series' Bobrick 1082.67P

2.3 MATERIALS

A. Solid Phenolic Panel: NEMA LD-3 solid phenolic core with melamine laminate veneer material.

B. Stainless Steel: ASTM A167, Type 304.

2.4 ACCESSORIES

A. Pilaster Shoe: ASTM A167, Type 304 stainless steel, with adjustable screw jack.

B. Headrail: 1 inch x 1-5/8 inch anodized extruded aluminum; with anti-grip configuration; and stainless steel wall brackets.

C. Attachments, Screws, and Bolts: Stainless steel with Torx pin head.

D. Through-Bolts and Nuts: Stainless steel with Torx pin head.

2.5 HARDWARE

A. Hinges: Full-height continuous hinges of 16 gage stainless steel. Spring-loaded and self-closing.

B. Latch and Keeper, Standard Doors: 16 gage stainless steel combination slide latch and bumper.

C. Latch and Keeper, Accessible Stall Doors: U-shaped handle with concealed latch.

D. Door Stop: Vinyl coated 11 gauge steel door stop.

E. Coat Hook: 12 gage stainless steel clothes hook. See Section 10 28 00 - Toilet and Bath Accessories.

F. Door Pull: Stainless steel door pull both sides at accessible stall.

G. All hardware shall be concealed inside compartments with the exception of out-swing doors.

H. Panel Brackets: Full length continuous "U" channel brackets of 16 gage stainless steel.

2.6 FABRICATION

A. Doors and Panels:

1. Door Thickness: 3/4 inch.
2. Panel Thickness: 1/2 inch.
3. Door Width: 24 inches.
4. Door Width for Accessible Use: 32 inch front entry, 34 inch side entry.
5. Height: 58 inches.

B. Pilasters: 3/4 inch thick, constructed same as doors, of sizes required to suit cubicle width and spacing.

C. Furnish units with cutouts and drilled holes to receive partition mounted hardware, accessories, and grab bars as indicated.

D. Concealed hardware fasteners shall have a metal-to-metal connection that shall withstand a direct pull of 1,500 lbs per screw.

2.7 FINISHES

A. Phenolic Panels: Color from manufacturer's standard color selections.

B. Stainless Steel Surfaces: No. 4 finish.

C. Aluminum: Clear anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive Work.

B. Verify field measurements are as shown on Shop Drawings.

C. Verify correct location of built-in framing, anchorage, bracing, electrical and plumbing fixtures.

D. Beginning of installation means installer accepts existing conditions.

3.2 ERECTION

A. Erect in accordance with manufacturer's instructions.

B. Install partition components secure, plumb and level.

C. Attach panel brackets securely to walls and floors using appropriate anchor devices.

D. Set all floor anchors and pilaster shoes firmly in mastic.

E. Attach panels and pilasters to brackets with through bolts and nuts. Locate headrail joints at pilaster center line.

F. Provide 1/2 inch space between wall surface and panels or pilasters.

G. Provide for adjustment of floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

H. Equip each toilet stall door with hinge, door latch, pull, and clothes hook.

I. Equip each accessible toilet stall door with two pulls, one each side of door, and clothes hook. Mount coat hook at 48 inches maximum height or as required by ADA for accessible stalls.

J. Install door strike keeper on each pilaster in alignment with door latch.

K. Equip each toilet stall door with coat hook and bumper.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb or Level: 1/8 inch.

B. Maximum Misplacement From Intended Position: 1/8 inch.

3.4 ADJUSTING

A. Adjust Work under provisions of Section 01 70 00.

B. Adjust and align door hardware to uniform clearance at vertical edges of doors. Clearance space not to exceed 3/16 inch.

C. Adjust door hinges so that free movement is attained and will locate in-swinging doors in partial open position when unlatched. Return out-swinging doors to closed position.

3.5 CLEANING

A. Clean Work under provisions of Section 01 70 00.

B. Remove protective coverings.

C. Clean surfaces and hardware.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01 87 00.

B. Field touch-up of finished surfaces will not be permitted.

C. Replace damaged or scratched materials with new materials.

END OF SECTION 10 21 13

SECTION 10 28 00
TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories.

B. Attachment hardware.

1.2 REFERENCES

A. ADAAG - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

B. CCR - California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.

C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.

D. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

E. ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products.

F. ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

G. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

H. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Provide Product Data on accessories, describing size, finish, details of function, attachment methods.

C. Submit manufacturer's installation instructions.

1.4 KEYING

A. Supply two keys for each accessory to Owner.

B. Master key all accessories.

1.5 REGULATORY REQUIREMENTS

A. Conform to CCR, Title 24, Part 2, and ADA for accessibility requirements.

1.6 COORDINATION

A. Coordinate the Work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bobrick Washroom Equipment, Inc.

B. NVI

C. WausauPaper

D. Rubbermaid / United Receptacle

E. Substitutions: Under provisions of DIVISION 1.

2.2 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel, Type 304.

D. Adhesive: Two-component epoxy type waterproof.

E. Fasteners, Screws, and Bolts: Hot-dip galvanized, tamperproof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Back-paint components where contact is made with building finishes to prevent electrolysis.

E. Shop-assemble components and package complete with anchors and fittings.

F. Provide steel anchor plates, adapters, and anchor components for installation.

G. Hot-dip galvanize all ferrous metal and fastening devices.

2.4 FACTORY FINISHING

A. Galvanizing: ASTM A123 to 1.25 ounces per square yard.

B. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

C. Stainless Steel: No. 4 satin finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive Work and dimensions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site at appropriate time for building-in.

B. Provide templates and rough-in measurements as required.

C. Verify exact location of accessories for installation.

3.3 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.
C. Verify that no equipment in accessible toilet stalls protrudes past the face of the wall by more than 3 inches.

3.4 SCHEDULE

A. Model numbers refer to Bobrick, NVI and WausauPaper products, as a standard of quality and performance. See drawing sheet A4.1 ENLARGED RESTROOM FLOOR PLANS and sheet A4.2 BLDG J & BLDG C – ENLARGED RESTROOM PLANS Keynotes for accessories not listed below

Model No.	Description	Power	Remark
B-6806-99	1-1/2" diameter x 42" long grab bar refer to Drawings for anchorage	na	-
B-6806-99	1-1/2" diameter x 36" long grab bar refer to Drawings for anchorage	na	-
B-2111/B-2112	Soap dispenser, vertical / horizontal orientation	na	Provide at all lavatories and sinks in scope-
B-2012	Automatic Wall-Mounted Soap Dispenser	Batteries (3) 1.5V C	Provide at Pre-K sink locations (Rm F-13)
OptiServ 86800	.Wausau aper towel dispenser, surface mounted	na	Provide at all lavatories and sinks in scope--
NVI D67013	Toilet paper dispenser, surface mounted	na	-
B-3888	Toilet paper dispenser, recessed	na	-
B-221	Seat Cover Dispenser, surface mounted	na	-
B-165	Glass Mirror, 18” x24” framed	na	-
B-2260	Trash Receptacle. 21-gallon satin finish stainless steel open top.	na	Provide (1) per toilet room

END OF SECTION

SECTION 11 12 00
PARKING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Parking gates and operators.

B. Sensors and accessories

1.2 RELATED SECTIONS

A. Section 03 10 00 Concrete Formwork and Accessories

B. Section 03 30 00 Cast-in-Place Concrete

C. Section 26 05 19 Low-Voltage Electrical

D. Section 26 05 33 Underground Ducts And Raceways For Electrical

E. Section 28 13 00 Access Control System

1.3 REFERENCES

A. Underwriters Laboratories (UL): UL 325 – Standard for Safety for Door, Drapery, Gate, Louver, and Window Operators and Systems.

B. Underwriters Laboratories (UL): UL 991 – Standard for Tests for Safety Related Controls Employing Solid-State Devices.

C. American Society Testing Materials (ASTM): ASTM F2200 – Standard Specification for Automated Vehicular Gate Construction.

D. National Electrical Manufacturers Association (NEMA): NEMA ICS 6 – Industrial Control Systems: Enclosures.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, edge connections, and accessories.

1. Operation, installation, and maintenance manuals including wire diagrams.
2. Risers, layouts, and special wiring diagrams showing any changes to standard drawings.

C. Product Data: Manufacturers data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements.
   3. Installation methods.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 70 00.

B. Submit operation data for gate controls.

C. Submit maintenance data for gate operator.

1.6 QUALIFICATIONS

A. Installer: Company specializing in installing the Work of this Section with minimum three years documented experience, approved by manufacturer.
   1. Provide documentation of maintenance and repair service availability for emergency conditions.
   2. Provide quarterly maintenance for one year following Substantial Completion of the Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 87 00.

B. Store products indoors in manufacturer's original containers and packaging with labels clearly identifying product name and manufacturer. Protect from damage.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate Work under provisions of Section 01 31 19.

B. Coordinate requirements and installation of electrical Work.

1.9 WARRANTY

A. Provide one year warranty under provisions of Section 01 70 00.

B. Warranty: Include coverage of gate operator and controls minimum five year. .

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Basis of Design: Door King, Inc., (800) 826-7493.

2. Approved equal.

B. Basis of Design Product

1. DoorKing 1601 Parking Control Barrier Gate

2.2 PARKING / BARRIER GATE OPERATOR

A. Microprocessor based solid-state control board interacting with card readers, RF transmitters, access control systems, ticket machines, other activating devices as required, external devices for pedestrian sensing (photo-eyes) and vehicle (loop) sensing systems. Control board shall include built-in down timer (1-25 seconds), built-in ports for two (2) plug-in loop detectors, Up input memory buffer, down command options, programming switches to set various operating modes, PAMS sequencing inputs (Perimeter Access Management System), inherent current sensing reverse system.

1. Compliance: Compliant to UL 325, UL 991 and CSA C22.2 No. 247 and listed by Intertek Testing Laboratories NA, Inc. (ETL), a Nationally Recognized Testing Laboratory.
   a. This model is intended for use in Class II, III and IV vehicular barrier gate applications.
2. Warranty: Five (5) year manufacturer's standard warranty.
3. Operator speed: 90-degrees in approximately 1.5 seconds.
4. Enclosure: 12 gage, 0.105 inch (2.6 mm) G90 hot-dipped galvanized steel, powder coated, full gloss smooth super TGIC, polyester white.
5. Configuration: Left or right hand mount. In the event of an obstruction close by the barrier gate, operator can be reversed to allow access to cabinet door.
6. Motor: 1/2 HP, continuous duty.
7. Gear Reduction: 60:1 wormgear running in a continuous oil bath with 360-degrees of gear travel.
8. Magnetic Limit Switches: No mechanical switches to wear out or break.
9. Operating Switches: Built-in power (on-off) and operating (up-down-normal) toggle switches.
10. Convenience Outlets: Two (2) 115 VAC for accessory transformers.
11. Electrical Power Requirements: 120 VAC.

2.3 GATE ARM

A. Gate Arms: Fully retroreflectorized on both sides, vertical stripes alternately red and white at 16-inch intervals as required by the Manual on Uniform Traffic Control Devices (MUTCD).
   1. 12-foot, 3-inch round aluminum.

2.4 PEDESTRIAN PROTECTION

A. Photo-electric eye / auxiliary loop detector relay switch.
.
   1. Basis of Design: Requires 9411 loop detector used in conjunction with photo-eye.
   2. Photo Eye: provide thru-beam photo eye in conjunction with down loop. Provide all necessary under ground wiring for photo eye system.

2.5 ACCESSORIES:

A. Arm Breakaway kit.

B. Plug-in loop detectors.

C. Electric reversing edge – reverses rotation of arm on contact with an obstruction.

D. Backup power inverter – allows systems to remain in operation upon loss of primary (AC) power.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and openings are ready to receive Work.

B. Verify field measurements are as shown on Shop Drawings.

C. Verify that required utilities are available, in proper locations, and ready for use.

D. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Installed by a qualified technician who is certified by the Institute of Door Dealer Education and Accreditation (IDEA) as a Certified Automatic Gate Operator Installer (CAGOI).

B. Model 1601 shall be mounted, firmly secured, plumb and level, as required.

C. Wiring shall be uniform and in accordance with national electric codes and manufacturers instructions.

D. All splices shall be in easily accessible junction boxes or on terminal boards.

E. All cable runs in all junction boxes shall be tagged and identified.

F. Coordinate all work with other effected trades and contractors.

3.3 SYSTEM INITIALIZING AND PROGRAMMING

a. System shall be turned on and adjustment made to meet requirements of specifications and on-site conditions.

b. System shall function as specified.

3.4 SYSTEM TEST PROCEDURES

a. System shall be completely tested to assure that all components and accessories are hooked-up and in working order.

b. System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.

c. System shall be tested in presence of owner's representative.

3.5 OWNER INSTRUCTIONS

A. Installation contractor shall conduct up to (1) hour of instruction in use and operation of the system to designated owner representatives, within (30) days of acceptance.

B. Installation contractor shall conduct up to (1) hour of technical training, in troubleshooting and service of the system, to designated owner representatives within (90) days of system acceptance.

3.6 MAINTENANCE

A. Provide District with all Installation and Maintenance manuals.

END OF SECTION

SECTION 11 68 16

PLAY STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work included: Furnish all items including but not limited to all labor, materials, equipment, rentals, facilities, transportation, incidentals, excavations, footings, and services to complete all Playground Structures and related work as shown on the drawings and/or specified herein and as necessary for a complete installation.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1. ASTM A 135 (1989a; R 1993) Electric-Resistance-Welded Steel Pipe

2. ASTM A 153 (1982; R 1987) Zinc Coatings (Hot-Dip) on Iron and Steel Hardware

3. ASTM A 385 (1980; R 1991) High-Quality Zinc Coatings (Hot-Dip)

4. ASTM A 500 (1990a; R 1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

5. ASTM A 513 (1991a; R 1992) Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing

6. ASTM B 117 (1990) Salt Spray Resistance Test

7. ASTM B 221 (1992a; R 1993) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

8. ASTM D 822 (1989) Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon Arc Light and Water Exposure Apparatus

9. ASTM D 1248 (1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials

10. ASTM D 1734 (1993) Flexibility Mandrel Test

11. ASTM F 1951

12. ASTM D 2454 (1991) Overbake Hardness Test

13. ASTM D 2794 (1992; R 1993) Resistance of Organic Coatings to the Efforts of Rapid Deformation (Impact)

14. ASTM D 3359 (1992a; R 1993) Measuring Adhesion by Tape Test

15. ASTM D 3363 (1992a) Pencil Hardness Test

16. ASTM F 1292 (1993) Impact Attenuation of Surface Systems Under and Around Playground Equipment

17. ASTM 1487, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

18. ASTM 2372, Play Equipments for Children Under the age of Two

C. FEDERAL AND STATE STANDARDS

1. ADA Standards, especially scoping Section 240 and technical requirements Section 1008.

2. California Building Code, especially scoping Section 11B-240 and technical requirements Section 11B-1008.

D. FEDERAL SPECIFICATIONS

1. FS L-P-390 (1987) Plastic Molding Material FEP Fluorocarbon, Molding and Extrusion (Low, Medium and High) Density

2. FS QQA-200/8F (11/8/83) Aluminum Alloy 6061, Bar, Rod, Shapes, Tubes, and Wire Extruded

E. CODE OF FEDERAL REGULATIONS

1. 28 CFR Part 36 (7/26/91) Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule.

F. MANUFACTURER'S STANDARD SPECIFICATIONS AND DETAILS

1.3 PERFORMANCE REQUIREMENTS

A. Installer Qualifications

1. Engage an experienced installer or applicator that has specialized for a minimum of 10 years in installing the specific play equipment required for this Project and who is acceptable to Manufacturer of primary materials. Installer must provide a minimum of 3 documented and inspectable installations within 100 mile radius of the subject project at least 5 years old with project names, dates, and owner contracts provided with the submittal. The Contractor shall furnish a list of projects using either specified material or equivalent that they have installed during the last three years. Information shall include project name, square footage, owner contact name with owner's address and phone number. Also, the contractor shall furnish resumes detailing the experience of key personnel, including supervisors and mechanics. The Contractor shall be approved in writing by the material primary manufacturer for the system being installed.

B. Assign a full-time employee to the job as supervisor for the duration of the Contract with a minimum of four (4) years experience in playground equipment installation.

C. Labor Force

1. Provide installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner, acceptable to the District.

D. Safety

1. Play equipment shall meet the safety requirements of CPSC and ASTM F 1487.

E. Accessibility

1. Play equipment intended for access by children with disabilities shall meet the requirements of CPSC and ASTM F 1487 and the Federal and State standards listed above. The intent of the play equipment should be that it is usable by children with disabilities, not merely accessible.

1.4 REGULATORY REQUIREMENTS

A. Conform to all federal, state, Owner, local codes and requirements for installation and disabled accessibility as referenced herein and as applicable.

1.5 SUBMITTALS

A. Submit a listing of at least five installations where the brand of play equipment with similar units to those proposed has been installed and has been in successful service for at least five years. This list shall include owner or purchaser; address of installation; service or maintenance organization; date of installation; and contact person and phone number.

B. The installer of the play equipment must submit proof of liability insurance of at least $1,000,000 from a reputable insurance company covering defects in materials, workmanship, and installation. This liability shall cover any bodily harm resulting from a failure of play equipment due to installation defects.

C. The installer of the playground equipment must submit proof that they are a certified installer of the playground equipment primary manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer

1. Company specializing in the manufacture of products specified in the Section with a minimum of 10 years documented experience.

B. Safety Inspector

1. Contractor shall engage a certified playground safety inspector (CPSI) to provide a 3rd party review of the design prior to ordering equipment, provide (2) field inspections during construction and provide a final playground safety report. CPSI shall notify Contractor and landscape architect immediately of any deficiencies

C. Installer

1. Company specializing in applying the work of the Section with minimum five years documented experience, approved by manufacturer.

1.7 MAINTENANCE DATA

A. Submit maintenance data under provisions and as follows:

1. Copy of certified playground inspection report

1.8 WARRANTY

A. Manufactured playground equipment shall be guaranteed against defects in workmanship or materials for a period of one year after acceptance by owner. All equipment shall be guaranteed by the primary manufacturer as specified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be delivered and stored in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 GENERAL ACCEPTABLE MANUFACTURERS

A. Playground Equipment

1. All playground equipment and playground signage shall be per plan. Contractor shall install all equipment per manufacturer's standard details and specifications. No substitutions shall be permitted as the equipment has been reviewed and approved by the owner.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to start of excavation, contractor shall lay out the entire outdoor play area and stake location of all elements, including play equipment, use zones, shade canopies, walls, pathways, planters, utilities, grades, and hard surfaces, based on actual playground equipment supplied to be installed. Use zones shall not overlap hard surfaces, and shall meet criteria of ASTM F 1292 and ASTM 1487. The Owner's representative reserves the right to adjust the equipment locations and other elements to meet field conditions and use zone safety requirements.

B. Contractor shall review all manufacturer specifications and details prior to start of work. Contractor shall adjust all equipment, including all climbers, nets, slides, post and deck elevations based on site grading to comply with manufacturer specifications and details, and with ASTM 1987 and CPSC.

C. Contractor shall provide independent 3rd party CPSI inspections per 1.6a.

3.2 INSPECTION

A. Verify that all units are as specified and are delivered free of damage.

B. Verify that all accessories required for installation are provided.

C. Verify play area drains.

D. Verify play surfacing thickness meets minimum fall height requirements for playground equipment.

3.3 COORDINATION

A. Coordinate with work of other sections to insure appropriate sequencing of events.

3.4 INSTALLATION

A. General

1. Play equipment shall be installed level, parallel plumb according to the manufacturer's installation specifications and as shown on the drawings to meet the requirements of CPSC and ASTM F 1487.

2. All playground equipment shall be certified by a National Playground Safety Inspector (NPSI) prior to occupancy. Any deficiencies noted by the NPSI shall be corrected by the contractor at the contractor's expense.

B. Concrete footings shall be installed in accordance with specifications 03 30 00 - Cement Concrete Pavement.

C. Surface mounted structure shall be secured to concrete sub slab as required by the manufacturer.

3.5 CLEANING

A. Clean all installed items, fasteners and supports in accordance with Manufacturers' instructions.

B. Cover or wrap all installed items to protect from weather and dirt from other trades.

C. Remove protective cover at date of substantial completion.

3.6 PROTECTION OF INSTALLED EQUIPMENT

A. Protect equipment from damage at all times, until final acceptance of the Work. If damage occurs to any equipment prior to final acceptance, Contractor shall, at his own expense, make replacement to satisfaction of the Owner.

3.7 SECURITY

A. The contractor shall provide means to keep the public from using any playground equipment until safety surfaces have been properly installed, the area cleaned and cleared, and all installation reviewed by the Owner's representative. The area shall be secured until authorized to be opened by the Owner's representative.

3.8 LEVEL OF SAFETY SURFACING

A. All Play equipment located in playground safety surfacing areas shall be clearly marked to indicate the finished level of safety surfacing material to meet impact attenuating requirements. All metal posts, springs or supports shall be as marked by the

manufacturer. Those items not marked by the manufacturer shall be marked with a 3/4" circle painted with black epoxy paint.

END OF SECTION

SECTION 12 49 40
ROLLER SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manually Operated Sunscreen roller shades.

B. Motorized Sunscreen FTS Skylight roller shades.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

B. Section 09 29 00 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

1.3 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
3. Storage and handling requirements and recommendations.
4. Mounting details and installation methods.
5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable..

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
1. Prepare shop drawings on Autocad or Microstation format using base sheets provided electronically by the Architect.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

E. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Standard Shadecloth: Manufacturer's standard twenty-five year warranty.

C. Ecoveil Shadecloth: Manufacturer's standard ten year warranty.

D. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five year warranty.

E. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: MechoShade Systems, Inc., which is located at: 42-03 35th St.; Long Island City, NY 11101; Local Representative: Lyndsey Harper Tel: 925-557-6675; Email:lyndsey.harper@mechosystems.com; Web:www.mechoshade.com

B. Requests for substitutions will be considered in accordance with provisions of Division 1 General Requirements. .

2.2 ROLLER SHADE TYPE AND SHADECLOTH

A. Manually Operated Shades:
1. Mounting: Recess mounted with #4124 ceiling pocket.
2. Configuration: Single solar shadecloth.
3. Solar Shadecloths – To Be Selected by Architect in Submittal Process.
   a. Fabric: ThermoVeil 1500, 3 percent open, 2 by 2 dense basket-weave pattern.
   -OR-
   b. Fabric: EcoVeil 1550, TPO fabric, Cradle to Cradle Certified, non-PVC, 1 X 1, basket-weave pattern at 3 percent open.
   -OR-
   c. Fabric: SoHo 1600, (3 percent open), 2 x 2 basket-weave pattern of fine yarn PVC and polyester blend.

2.3 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
2. Shade Band and Shade Roller Attachment:
   a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are

not acceptable.

b. Provide for positive mechanical engagement with drive / brake mechanism.
c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" "snap-off" spline mounting, without having to remove shade roller from shade brackets.
d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.4 SHADE FABRICATI0N

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

C. For railroaded shadebands, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

2.5 COMPONENTS

A. Access and Material Requirements:
1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Manual Operated Chain Drive Hardware and Brackets:
1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
    a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
    b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
    c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
    d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
    e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

    f. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.6 ROLLER SHADE SCHEDULE

A. Roller Shade Schedule: Provide roller shade at each window to receive new window work. Refer to the Drawings for locations.

B. Shade Type WT-1: Manual operating, chain drive, sunscreen roller shades at all exterior windows of rooms and spaces shown on the Drawings, wall mounted or ceiling mounted with mount bracket and fascia.

2.7 ACCESSORIES

A. Fascia:
1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Engage Installer to train District's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 93 43
BENCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Benches.

1.2 REFERENCES

A. ASTM Testing Standards:

1. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

2. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.

3. ASTM D 523 – Standard Test Method for Specular Gloss.

4. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

5. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

6. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test.

7. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test.

8. ASTM G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

B. ISO Testing Standards:

1. ISO 1520 – Paints and Varnishes – Cupping Test.

2. ISO 2815 – Paints and Varnishes – Buchholz Indentation Test.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.

B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.

C. Samples: Submit manufacturer's samples of materials, finishes, and colors.

D. Warranty: Manufacturer's standard warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of products specified in the Section with a minimum of five years documented experience.

B. Installer: Company specializing in applying the Work of the Section with minimum three years documented experience, approved by manufacturer

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.6 WARRANTY

A. Warranty Information:

-Products will be free from defects in material and/or workmanship for a period of three years from the date of invoice.

-The warranty does not apply to damage resulting from accident, alteration, misuse, tampering, negligence, or abuse.

PART 2 PRODUCTS

2.1 GENERAL

A. Products specified are indicative of the features, form, finish, and quality of the furnishings desired. Products of manufacturers other than those named may be acceptable upon proof of equality. Submit data as specified above.

B. All products shall be new, delivered to the site in manufacturer's original containers, and protected at all times from damage during shipping, storage, and handling prior to and during installation.

2.2 ACCEPTABLE MANUFACTURERS

A. Landscape Forms, Inc., 7800 E. Michigan Ave, Kalamazoo, Michigan 49048.
Phone: (800) 521-2546. Fax (269) 381-3455.
Website www.landscapeforms.com E-mail: specify@landscapeforms.com

2.3 BENCHES

A. “Gretchen” Benches

B. Styles:

1. Style 1:

a. Backless
b. Surface Mounted cantilever (Special Wall Mount Support per Landscape Forms)
c. Length: 8 feet

2. Style 2:
a. Backless
b. Surface Mounted cantilever (Special Wall Mount Support per Landscape Forms)
c. Length: 11 feet

Style 3:
a. Backed
b. Free Standing/Surface Mount Support legs.
c. Length: 6 feet
d. Anchor in place to concrete with ½” Diameter Hilti KB-TZ (ESR#1917) w/ 3-1/4” embedment.

2.4 MATERIALS

A. Seat:

3. Wood: consist of 3”x4” solid wood molded face boards, and 1-1/4” x 1-1/2” solid wood interior boards. All boards have eased edges as well as ends. Each board is individually fastened to steel profile straps and 713 tenzalloy cast aluminum back straps. The screws are black phosphate plated.

a. Wood for Exterior Use:
2) Ipe: Solid stock, select South American hardwood.

B. Supports: Supports are 713 tenzalloy cast aluminum.

2.5 ACCESSORIES

A. Anchor Bolts: Corrosion resistant recommended (not supplied by manufacturer)

2.6 RECYCLED CONTENT

A. Wood Benches:
-Recyclable: 100 percent.

2.7 FABRICATION

A. Shop assembled benches.

2.8 FINISHES

A. Finish on Metal: Landscape Forms, Inc. “Pangard II”.

1. Primer: Rust inhibitor.

4. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.

3. Test Results: “Pangard II”.

a. Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.

b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.

c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.

e. Erichsen Cupping, ISO 1520: 8 mm.

f. Impression Hardness, Buchholz, ISO 2815: 95.

g. Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.

h. Pencil Hardness, ASTM D 3363: 2H minimum.

i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.

j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.

4.Color: TBC from standard colors

B. Finish on Wood:
1.Wood for Exterior Use: Unfinished.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive benches.

B. Notify Architect of conditions that would adversely affect installation or subsequent use.

C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install benches in accordance with manufacturer's instructions at locations indicated on the Drawings.

B. Install benches level.

C. Anchor benches securely in place.

3.3 ADJUSTING

A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

A. Clean benches promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

A. Protect installed benches to ensure that, except for normal weathering, benches will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 22 05 01
PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 LEAD FREE POTABLE WATER SYSTEM

A. All plumbing components including but not limited to pumps, pipe, valves, faucets, strainers, backflow preventers and other wetted parts shall comply with California AB-1953.

1.2 QUALITY ASSURANCE

A. All cast iron, steel and copper pipe and fittings shall be manufactured in the United States.

END OF SECTION

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SECTION 22 08 13
TESTING PIPING SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pressure testing of the following systems:
   1. Plumbing piping (sewer lines, water lines, rainwater lines)
   2. Natural gas piping
   3. Condensate piping

1.2 SUBCONTRACTOR REQUIREMENTS

A. Notify AHJ or designated design team contact at least 48 hours (2 working days) in advance to arrange for witnessing of the piping test.

B. For discharge requirements of water used for pressure testing comply with Water Discharge Requirements.

C. Notify AHJ immediately in the event of any accidental discharge.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00, Submittal Procedures:
   1. Hydrostatic test plan for approval that includes:
      a. Material of construction
      b. Design pressure
      c. Test pressure and duration of test
      d. Test medium and method of achieving the test pressure
      e. Certification on calibration of pressure gauges
      f. Method to exclude personnel from the area containing the system to be tested.
      g. Over pressurization protection/prevention: Device make/model number, certification, pressure relief set point, point of installation in system.
      h. Test Reports: Submit test results within 10 working days of successful test.
   2. Pneumatic test plan for approval that includes:
      a. Material of construction
      b. Design pressure
      c. Test pressure and duration of test
      d. Test medium and method of achieving the test pressure
      e. Certification on calibration of pressure gauges
      f. Method to exclude personnel from the area containing the system to be tested.
      g. Over pressurization protection/prevention: Device make/model number, certification, pressure relief set point, point of installation in system.

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h. Test Reports: Submit test results within 10 working days of successful test.

PART 2 - PROOUCTS

2.1 MATERIALS

A. Furnish instruments, equipment, material and labor necessary to conduct tests.

B. Calibrate testing equipment at reasonable intervals with devices of accuracy traceable to National Institute of Standards and Technology (NIST).

C. Test gauges used in conducting test shall be in accordance with IAPMO UPC.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. All piping systems installed shall be tested in accordance with this section.

B. No testing procedure here shall be considered in lieu of any more stringent code requirements.

C. Piping being tested shall remain exposed until AHJ has approved the piping test results.

D. Trenches may be backfilled between joints before testing to prevent movement of pipe during testing. Ensure that thrust blocks are sufficiently hardened before testing.

E. Piping being tested shall not leak nor show any loss in test pressure for duration specified unless otherwise noted.

F. Where portion of piping system is to be concealed before completion, the portion shall be tested separately as specified for the entire system.

G. Ensure piping supports are in place.

H. Isolate system gages, sensors, etc., from pressure tests so instruments and devices are not damaged. Test pressure shall not exceed the maximum allowable test pressure for any vessel, pump, valves, or other component in the system.

I. Hydrostatic (Water) Testing:
   1. Use potable water as test medium. Do not fill system until the Owner OTR has approved the source of water supply.
   2. Provide vents at high points to release trapped air while filling system.
   3. Provide drains at low points for complete removal of test liquid.

4. Drain system if there is a potential for freezing, i.e., no heat in building, coil in outside air stream, or other similar situations.

J. Pneumatic (Air) Testing:
1. Use clean dry air (Excluded from use with natural gas pipe testing) or inert gas as the test medium.
2. Barricade the area around the system to be tested.
3. Prior to application of full air test pressure, apply a preliminary test of not more than 10 psig to reveal possible major leaks.
4. After preliminary test, raise pressure in stages not more than 25 percent up to full test pressure, allowing at least 10 minutes for equalization of strain and detection of major leaks at each intermediate stage. Hold final test pressure for time specified.
5. Examine piping for leakage using soap bubble solution, or by test gage monitoring.

K. If leaks are found, they shall be eliminated by tightening, approved repair method, or replacement, as appropriate and test repeated until no leakage is found.

3.2 PRESSURE TESTING

A. Plumbing Piping:
1. Sanitary Waste and Vent Piping Within Building Wall, including condensate drain line from cooling coils:
   a. Test with water in accordance with the IAPMO UPC and CPC to a minimum of 10 foot head of water. Keep water in system for at least 1 hour before inspection starts.
   b. Acceptable Alternate: Test with air at 5 psig and hold pressure for at least 1 hour; note: This alternative method shall not be used for plastic piping,
   c. For modifications to existing plug the outlet of the drain piping, and fill pipe with water to the point of overflow. After 15 minutes, check piping for leaks. No loss of water from the piping for the duration of the test indicates that the system meets the requirements of the project. (Per UPC and CPC)
2. Sanitary Sewer Piping Beyond Building Wall (other than Force Main): Completely fill system with water and let stand for at least 1 hour before inspection starts, then visually inspect to ensure that all joints are tight.
   a. For partial system tests, test with water in accordance with the IAPMO UPC and CPC to a minimum of 10 foot head of water. Keep water in system for at least 1 hour before inspection starts.
   b. Acceptable Alternate: Test with air at 5 psig and hold pressure for at least 1 hour
      1) Note: This alternative testing method shall not be used for plastic piping.
3. Sanitary Sewer Force Main: Test with water at 1.5 times operating pressure, 25 psig minimum for 4 hour.
4. Potable Water Inside Building to Site Main: Test with water at 1.5 times operating pressure, 100 psig minimum for 4 hours.

5. Nonpotable Water: Test with water at 1.5 times operating pressure, 100 psig minimum for 4 hour.
6. Rainwater Piping:
   a. Rainwater Piping within 5 feet of Building: Test with water in accordance with the IAPMO UPC and CPC. Fill the entire system with water to the point of overflowing. Keep water in system for at least 1 hour before inspection starts. If the system is tested in sections, no piping (except the uppermost 10 foot of the system) shall have been submitted to a test of less than 10 foot head of water. Acceptable Alternate: Test with air at 5 psig and hold pressure for at least 1 hour; note: pneumatic testing may not be used for plastic piping.
   b. Rainwater Piping Beyond 5 feet of Building: Completely fill system with water and let stand for at least 1 hour before inspection starts, then visually inspect to ensure that all joints are watertight.
7. Storm Water Piping, Above Grade
   a. Double containment piping along with leak detection cable shall be tested per manufacturer's recommendations.
8. Natural Gas Piping
   a. Operating Pressure to 5 psig: Test with air or inert gas at 60 psig for 8 hours
9. Condensate Service Piping: Test with water at 1.5 times operating pressure, 100 psig minimum for 4 hours.
   a. Condensate Distribution Piping Systems:
      1) Distribution Piping: Test with air or inert gas at 180 psig minimum for 4 hours This would be the appropriate pressure if the distribution piping design pressure is 120 psig. If the design pressure is different, this test pressure should be adjusted.
      2) Preinsulated Conduit Systems: Outer steel casing, test with air at 15 psig for 4 hours or as otherwise specified in manufacture's written instructions.

3.3 TESTING FOR HOLIDAYS:

A. Test the following buried coated steel piping systems for holidays:
   1. Natural gas.
   2. Perform holiday test in accordance with the following procedure:
      a. After pipe has been welded, joints wrapped, and pipe is ready for lowering into trench, test coating for flaws (holidays). Test coated piping system throughout its length for flaws in coating system by means of a high-potential flaw detector that can impress a maximum of [8,000] volts across coating. One electrode of tester shall maintain complete circumferential contact with coating while transversing entire length of coating system and other electrode shall be the underlying metal pipe. An electrical discharge through coating detected visually or by instrument, shall constitute failure of this test.
         1) Important! Do not cut ground cable to a shorter length. The length supplied is important to proper operation of the detector. Keep as much of the cable as possible in contact with the earth. Straighten out kinks where possible and do not let it ride

up over skids. In dry areas it will help to drag the cable in the ditch where there is more moisture. The pipe should be grounded.

b. Mark holidays as they are found and repair prior to lowering pipe into trench. Repair holidays in factory coating by removing initial coating and undercoating for a minimum of 4 inches on each side of holiday. Remove coating around holiday and feather edge to pipe wall for sufficient distance to make a satisfactory repair. Apply primer (Polyken 1027) to the holiday to form a bond over the entire surface of the holiday and then spirally wrap pipe with a double layer of half-lapped 35 mil polyethylene tape (Polyken 934) for a minimum of 2 inches on each side of the holiday.

1) Repair holidays in joint wrappings by removing field applied coating in area of holiday and rewrapping. Owner OTR or designated representative will approve all areas of joint coating.

3.4 RETESTING

A. If piping does not pass test, locate and repair leaks and repeat testing procedure until satisfactory results are obtained.

1. Make repairs to piping with new materials. Caulking on screwed joints, cracks, or holes is not acceptable.

END OF SECTION

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SECTION 221005
PLUMBING PIPING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Storm water.
   4. Gas.
      a. Gas System Pressure: One pressure range. 0.5 psig or less.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083113 - Access Doors.

C. Section 099100 - Painting.

D. Section 220719 - Plumbing Piping Insulation.

E. Section 262717 - Equipment Wiring: Electrical characteristics and wiring connections.

F. Section 220501 - Plumbing General Requirements

1.3 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; 2010.

B. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 2011.

C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2011 (ANSI/ASME B31.9).

D. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2010.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

F. AWWA C606 - Standard Specification for Grooved and Shouldered Joints; American Water Works Association; 2011.

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G. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2009.

H. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2011

I. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; Latest issue shall apply.

J. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; Latest issue shall apply.

K. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.

1.4 SUBMITTALS

A. See Section 012500 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Operation and maintenance data.

D. Project Record Documents: Record actual locations of valves.

E. Field quality-control test reports.

F. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

G. Welding certificates.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of California, standards.
   1. Maintain one copy on project site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME (BPV IX).

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

F. Sanitary, Waste and Vent Piping
   1. Piping materials shall bear label, stamp, or other markings of specified testing agency.
   2. All piping shall be American made.

G. Domestic Water Piping
   1. Piping materials shall bear label, stamp, or other markings of specified testing agency.
   2. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," and NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for combined fire-protection and domestic water service piping to building.
   3. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.
   4. All piping shall be American made.

H. Storm Drainage Piping
   1. Piping materials shall bear label, stamp, or other markings of specified testing agency.
   2. All piping shall be American made.

I. Gas Piping
   1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."
   3. FMG Standard: Provide components listed in FMG's "Fire Protection Approval Guide" if specified to be FMG approved.
   4. IAS Standard: Provide components listed in IAS's "Directory of A. G. A. and C. G. A Certified Appliances and Accessories" if specified to be IAS listed.
   5. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.
   6. All piping shall be American made.
   7. Coordination
      a. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
         1) Notify CM/District not less than two days in advance of proposed utility interruptions.
         2) Do not proceed with utility interruptions without Architect's written permission.

J. Hangers and Supports
   1. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

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2. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and seismic restraint by a qualified professional engineer.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of California plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING & CONDENSATE PIPING (DOWNSTREAM OF NEUTRALIZATION), BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Soil Pipe
   1. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) or receive prior approval of the engineer.
   2. Manufacturers:
      a. AB&I Foundry
      b. Charlotte Pipe
      c. Tyler Pipe
   3. Cast Iron Pipe: ASTM A 888 or CISPI 301, hubless.
      a. Fittings: Cast iron, ASTM A 888 or CISPI 301.
      b. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
      c. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.

1) Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
   a) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
   b) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.
2) Heavy-Duty, FMG-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.
   a) NPS 1-1/2 to NPS 4: 3-inch- wide housing with 2 bands.
   b) NPS 5 to NPS 10: 4-inch- wide housing with 2 bands.
3) Heavy-Duty, Cast-Iron Couplings: ASTM A 48, 2-piece, cast-iron housing; stainless-steel bolts and nuts; and sleeve.

2.2 SANITARY SEWER PIPING & CONDENSATE PIPING (DOWNSTREAM OF NEUTRALIZATION), ABOVE GRADE

A. Cast Iron Soil Pipe
   1. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) or receive prior approval of the engineer.
   2. Manufacturers:
      a. AB&I Foundry
      b. Charlotte Pipe
      c. Tyler Pipe
   3. Cast Iron Pipe: ASTM A 888 or CISPI 301, hubless.
      a. Fittings: Cast iron, ASTM A 888 or CISPI 301.
      b. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
      c. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
         1) Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
            a) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
            b) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.
         2) Heavy-Duty, FMG-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.
            a) NPS 1-1/2 to NPS 4: 3-inch- wide housing with 2 bands.
            b) NPS 5 to NPS 10: 4-inch- wide housing with 2 bands.

2.3 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn, Type K; ASTM B88, soft, annealed, Type K
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: AWS A5.8, BCuP copper/silver braze.

2.4 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Transition Couplings: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
4. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.
    a. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
    b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
    c. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
5. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
    a. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
    b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
    c. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.5 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Soil Pipe
1. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) or receive prior approval of the engineer.
2. Manufacturers:
    a. AB&I Foundry
    b. Charlotte Pipe
    c. Tyler Pipe
3. Cast Iron Pipe: ASTM A74 service weight.
    a. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
    b. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
4. Cast Iron Pipe: CISPI 301, hubless.
    a. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
        1) Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral center pipe stop.

a) Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
   (1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
   (2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.
b) Heavy-Duty, FMG-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.
   (1) NPS 1-1/2 to NPS 4: 3-inch- wide housing with 2 bands.
   (2) NPS 5 to NPS 10: 4-inch- wide housing with 2 bands.
      (a) Heavy-Duty, Cast-Iron Couplings: ASTM A 48, 2-piece, cast-iron housing; stainless-steel bolts and nuts; and sleeve.

2.6 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Soil Pipe
   1. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.
   2. Manufacturers:
      a. AB&I Foundry
      b. Charlotte Pipe
      c. Tyler Pipe
   3. Cast Iron Pipe: CISPI 301, hubless, service weight.
      a. Cast Iron Pipe: ASTM A 888 or CISPI 301, hubless.
      b. Fittings: Cast iron, ASTM A 888 or CISPI 301.
         1) Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
         2) Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
            a) Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
               (1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
               (2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.
            b) Heavy-Duty, FMG-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.
               (1) NPS 1-1/2 to NPS 4: 3-inch- wide housing with 2 bands.
               (2) NPS 5 to NPS 10: 4-inch- wide housing with 2 bands.

2.7 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

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1. Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.
   a. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
   b. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
   c. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
   d. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
   e. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
   f. Joint Compound and Tape: Suitable for natural gas.
   g. Steel Flanges and Flanged Fittings: ASME B16.5.
   h. Gasket Material: Thickness, material, and type suitable for natural gas.

B. Transition Fittings: Type, material, and end connections to match piping being joined.

C. Common Joining Materials: Refer to Division 23 for joining materials not in this Section.

D. Protective Coating
   1. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere.

E. Specialties
   1. Flexible Connectors: ANSI Z21.24, copper alloy.
   2. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.8 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Fittings
   1. Dielectric fittings shall not be used. In their place brass nipples a minimum of 6" in length or 6 times the pipe diameter, whichever is longer, shall be used in all locations that otherwise would have required a dielectric fitting.

2.9 PIPE HANGERS AND SUPPORTS

A. Refer to Division 23 for seismic-restraint devices.

B. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

C. Manufactured Units
   1. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.
      a. Manufacturers:
         1) Grinnell Corp.
         2) Piping Technology & Products, Inc.
         3) Or equal.
      b. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
      c. Nonmetallic Epoxy Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
   2. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
      a. Manufacturers:
         1) Grinnell Corp.
         2) Unistrut Corp.
         3) Or equal.
      b. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
      c. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
   3. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) minimum compressive-strength insulation, encased in sheet metal shield.
      a. Manufacturers:
         1) Michigan Hanger Co., Inc.
         2) Pipe Shields, Inc.
         3) Or equal.
      b. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
      c. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
      d. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
      e. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
      f. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

D. Miscellaneous Materials

1. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
2. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
3. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, low-VOC, hydraulic-cement grout.
    a. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
    b. Properties: Nonstaining, noncorrosive, and nongaseous.
    c. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

E. Plumbing Piping - Drain, Waste, and Vent:
1. Refer to Division 23 for seismic-restraint devices.
2. Install the following:
    a. Vertical Piping: MSS Type 8 or Type 42, clamps.
    b. Individual, Straight, Horizontal Piping Runs: According to the following:
        1) 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
        2) Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
        3) Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
    c. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
    c. Base of Vertical Piping: MSS Type 52, spring hangers.
3. Support vertical piping and tubing at base and at each floor.
4. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
5. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
    a. NPS 3: 60 inches with 1/2-inch rod.
    b. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
    c. NPS 6: 60 inches with 3/4-inch rod.
    d. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
6. Install supports for vertical cast-iron soil piping every 15 feet.
7. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
    a. NPS 1-1/4: 84 inches with 3/8-inch rod.
    b. NPS 1-1/2: 108 inches with 3/8-inch rod.
    c. NPS 2: 10 feet with 3/8-inch rod.
    d. NPS 2-1/2: 11 feet with 1/2-inch rod.
    e. NPS 3: 12 feet with 1/2-inch rod.
8. Install supports for vertical steel piping every 15 feet.
9. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

F. Plumbing Piping - Water:
1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

G. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.
7. Refer to Division 23 for seismic-restraint devices.
8. Install the following:
   a. Vertical Piping: MSS Type 8 or Type 42, clamps.
   b. Individual, Straight, Horizontal Piping Runs: According to the following:
      1) 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      2) Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      3) Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
9. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
10. Base of Vertical Piping: MSS Type 52, spring hangers.
11. Support vertical piping and tubing at base and at each floor.
12. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
13. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
    a. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
    b. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
    c. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
    d. NPS 2-1/2: 108 inches with 1/2-inch rod.
    e. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
    f. NPS 6: 10 feet with 5/8-inch rod.
    g. NPS 8: 10 feet with 3/4-inch rod.
14. Install supports for vertical copper tubing every 10 feet.
15. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

H. Plumbing Piping - Gas:
1. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

a. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
b. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
c. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
d. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
e. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

2.10 BALL VALVES

A. Manufacturers:
1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.11 BUTTERFLY VALVES

A. Manufacturers:
1. Hammond Valve: www.hammondvalve.com.
2. Crane Co.: www.cranevalve.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.12 FLOW CONTROLS

A. Manufacturers:
1. ITT Bell & Gossett: www.bellgossett.com.
2. Griswold Controls: www.griswoldcontrols.com.
3. Taco, Inc: www.taco-hvac.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

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C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi psi.

2.13 SWING CHECK VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 2 Inches:
   1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

C. Over 2 Inches:
   1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.14 SPRING LOADED CHECK VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Crane Co.: www.cranevalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.15 RELIEF VALVES

A. Pressure Relief:
   1. Manufacturers:
      a. Cla-Val Co: www.cla-val.com.
      b. Henry Technologies: www.henrytech.com.
      c. Watts Regulator Company: www.wattsregulator.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:
   1. Manufacturers:
      a. Cla-Val Co: www.cla-val.com.
      b. Henry Technologies: www.henrytech.com.
      c. Watts Regulator Company: www.wattsregulator.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.16 STRAINERS

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. Green Country Filter Manufacturing: www.greencountryfilter.com.
   3. WEAMCO: www.weamco.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

D. Size 5 inch and Larger:
   1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.17 VALVES, GENERAL

A. Bronze Valves: NPS 2 and Smaller: Threaded ends, unless otherwise indicated.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

D. Valve Actuators:
   1. Handwheel: For valves other than quarter-turn types.
   2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.

E. Extended Valve Stems: On insulated valves.

F. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

G. Valve Grooved Ends: AWWA C606.
   1. Solder Joint: With sockets according to ASME B16.18.
      a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.
   2. Threaded: With threads according to ASME B1.20.1.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.18 DOMESTIC WATER PIPING: USE THE FOLLOWING TYPES OF VALVES:

A. Ball Valves, NPS 2 and Smaller: Two-piece, 400-psig CWP rating, copper alloy.

B. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.

C. Butterfly Valves, NPS 2-1/2 and Larger: Flangeless or single-flange, 150-psig CWP rating, ferrous alloy, with EPDM liner.

D. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 125, horizontal or vertical, bronze.

E. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 125, bronze.

F. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 125, gray iron.

G. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 125 minimum.

H. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type I or II, Class 125, cast iron.

2.19 SANITARY WASTE AND STORM DRAINAGE PIPING: USE THE FOLLOWING TYPES OF VALVES:

A. Ball Valves, NPS 2 and Smaller: Two-piece, 400-psig CWP rating, copper alloy.

B. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.

C. Swing Check Valves, NPS 2 and Smaller: Type 3, Class 125, bronze.

D. Swing Check Valves, NPS 2-1/2 and Larger: Type I or II, Class 125, gray iron.

2.20 SELECT VALVES, EXCEPT WAFER AND FLANGELESS TYPES, WITH THE FOLLOWING END CONNECTIONS:

A. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for condenser water, heating hot water, steam, and steam condensate services.

B. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded ends.

C. For Copper Tubing, NPS 5 and Larger: Flanged ends.

D. For Steel Piping, NPS 2 and Smaller: Threaded ends.

E. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded ends.

F. For Steel Piping, NPS 5 and Larger: Flanged ends.

PART 3 - EXECUTION

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3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Insulate underbodies and horizontal mains of Storm Piping.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Provide support for utility meters in accordance with requirements of utility companies.

I. Install valves with stems upright or horizontal, not inverted.

J. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

K. Install water piping to ASME B31.9.

L. Sleeve pipes passing through partitions, walls and floors.

M. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

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3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

N. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.
8. Support cast iron drainage piping at every joint.
9. Refer to Division 23 for additional information.

O. Sanitary, Waste and Vent Piping
1. Refer to Division 23 for basic piping installation.
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
3. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 23 for sleeves and mechanical sleeve seals.
4. Sleeve pipe passing through partitions, walls and floors.
5. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   a. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.
6. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 deg rees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
7. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants,

cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

8. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   a. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
      1) Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
      2) Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
9. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
10. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Domestic Water Piping
1. Refer to Division 23 for basic piping installation.
2. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
3. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 23 or sleeves and mechanical sleeve seals.
4. Sleeve pipe passing through partitions, walls and floors.
5. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Division 23 for pressure gages, and to Division 22 for drain valves and strainers.
6. Install water-pressure regulators downstream from shutoff valves. Refer to Division 22 for water-pressure regulators.
7. Install domestic water piping level with 0.25 slope downward toward drain and plumb.
8. Perform the following steps before operation:
   a. Close drain valves, hydrants, and hose bibbs.
   b. Open shutoff valves to fully open position.
   c. Open throttling valves to proper setting.
   d. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
   e. Remove and clean strainer screens. Close drain valves and replace drain plugs.
   f. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
9. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
10. Check plumbing specialties and verify proper settings, adjustments, and operation.
    a. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.
11. Energize pumps and verify proper operation.

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Q. Storm Piping

1. Refer to Division 33 Section for Project site storm sewer and drainage piping.
2. Refer to Division 23 Section for basic piping installation.
3. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.
4. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
5. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 23 for sleeves and mechanical sleeve seals.
6. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 23 for wall penetration systems.
7. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   a. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.
8. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 deg rees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
9. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
10. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:
11. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
12. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
    a. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
    b. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
13. Install engineered controlled-flow storm drainage piping in locations indicated.
14. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
15. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Gas Piping

1. Refer to Division 23 for basic piping installation requirements and piping joint construction.
2. Install service-meter assemblies aboveground and on or supported over precast concrete bases. Include gas valve or plug valve, strainer for each assembly.
    a. Install gas valve or plug valve and strainer upstream from each pressure regulator.
    b. Install service pressure regulators with vent outlet turned down and with corrosion-resistant-metal insect screen.
    c. Install pressure gage downstream from each service pressure regulator.
    d. Install service meters downstream from service pressure regulators.
    e. Install service meters with connections NPS 1 and smaller on meter bars.
    f. Install service meters with connections larger than NPS 1 supported from piping or set on concrete bases.
3. Service Entrance Piping: Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.
    a. Exterior fuel gas distribution system piping, service pressure regulator, and service meter will be provided by gas utility.
    b. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Refer to Division 23 for dielectric fittings.
    c. Install strainer upstream from each earthquake valve. Refer to Division 22 for strainers.
4. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.
    a. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
    b. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.
    c. In Walls: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in masonry walls, subject to approval of authorities having jurisdiction.
    d. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
5. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
    a. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe.

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Install with space between bottom of drip and floor for removal of plug or cap.

6. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.
7. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.
8. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
9. Connect branch piping from top or side of horizontal piping.
10. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
11. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.
12. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

S. Hangers and Supports

1. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
2. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
3. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
4. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
5. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
6. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
7. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
8. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe

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anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

9. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
10. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
11. Insulated Piping: Comply with the following:
    a. Attach clamps and spacers to piping.
        1) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
        2) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
        3) Do not exceed pipe stress limits according to ASME B31.9.
    b. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    c. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 deg rees.
    d. Shield Dimensions for Pipe: Not less than the following:
        1) NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
        2) NPS 4: 12 inches long and 0.06 inch thick.
        3) NPS 5 and NPS 6 : 18 inches long and 0.06 inch thick.
    e. Pipes NPS 8 and Larger: Include wood inserts.
    f. Insert Material: Length at least as long as protective shield.
    f. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
12. Refer to Division 23 for additional information.

T. METAL FABRICATION

1. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
    a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    b. Obtain fusion without undercut or overlap.
    c. Remove welding flux immediately.
    d. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

U. ADJUSTING

1. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

V. PAINTING

1. Touching Up: 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. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm). See Division 9 for paint materials and application requirements.
2. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.4 JOINT CONNECTIONS

A. Sanitary, Waste and Vent Piping

B. Refer to Division 23 Section for basic piping joint construction.
1. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   a. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
   b. Hubless Joints: Make with rubber gasket and sleeve or clamp.
2. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Domestic Water Piping
1. Refer to Division 23 Section for basic piping joint construction.
2. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. Storm Piping
1. Refer to Division 23 for basic pipe joint construction.
2. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   a. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
   b. Hubless Joints: Make with rubber gasket and sleeve or clamp.
3. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. Gas Piping
1. Install piping adjacent to appliances to allow service and maintenance. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

3.5 ROUGHING-IN FOR WATER METERS

A. Rough-in domestic water piping for water meter installation according to utility company's requirements. Water meters will be furnished by utility.

B. Rough-in domestic water piping and install water meters according to utility company's requirements. Refer to Division 23 for water meters.

3.6 VALVE INSTALLATION

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

F. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
   3. Lift Check Valves: With stem upright and plumb.

G. Check valves must be installed to follow any manufacturer recommendations regarding distance from pump discharge.

H. Sanitary, Waste and Vent Piping
   1. Shutoff Valves: Install shutoff valve on each sewage pump discharge.
      a. Use gate or full-port ball valve for piping NPS 2 and smaller.
      b. Use gate valve for piping NPS 2-1/2 and larger.
   2. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.
   3. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
      a. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
      b. Install backwater valves in accessible locations.
   4. Shutoff Valves: Install shutoff valve on each sewage pump discharge.
      a. Use gate or full-port ball valve for piping NPS 2 and smaller.
      b. Use gate valve for piping NPS 2-1/2 and larger.
   5. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.
   6. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
      a. Horizontal Piping: Horizontal backwater valves. Use normally closed type, inless otherwise indicated.

b. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
c. Install backwater valves in accessible locations.
d. Refer to Division 22 for backwater valves.

I. Domestic Water Piping
1. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
2. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
3. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
   a. Install hose-end drain valves at low points in water mains, risers, and branches.
   b. Install stop-and-waste drain valves where indicated.
4. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Refer to Division 22 for balancing valves.
5. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Division 22 for calibrated balancing valves.

J. Storm Piping
1. Shutoff Valves: Install shutoff valve on each sump pump discharge.
   a. Use gate or full-port ball valve for piping NPS 2 and smaller.
   b. Use gate valve for piping NPS 2-1/2 and larger.
2. Check Valves: Install swing check valve, downstream from shutoff valve, on each sump pump discharge.
3. Backwater Valves: Install backwater valves in piping subject to backlog.
   a. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
   b. Install backwater valves in accessible locations.
   c. Refer to Division 22 for backwater valves.

3.7 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide plug valves in natural gas systems for shut-off service.

I. Provide flow controls in water recirculating systems where indicated.

3.8 PIPING APPLICATIONS

A. Sanitary Waste and Vent
   1. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
   2. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
   3. Aboveground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
      a. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:
         1) Couplings: Heavy-duty, Type 301, stainless steel.
         2) Couplings: Heavy-duty, FMG approved.
      b. NPS 1-1/4 and NPS 1-1/2: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
         1) Couplings: Heavy-duty, Type 301, stainless steel.
         2) Couplings: Heavy-duty, FMG approved.
      c. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
         1) Couplings: Heavy-duty, Type 301, stainless steel.
         2) Couplings: Heavy-duty, FMG approved.
      d. NPS 2 to NPS 4: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
   4. Underground, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
      a. NPS 1-1/2: Hubless, cast-iron soil piping and one of the following:
         1) Couplings: Heavy-duty, Type 301, stainless steel.
         2) Couplings: Heavy-duty, FMG approved.
      b. NPS 2 to NPS 4: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
      c. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
         1) Couplings: Heavy-duty, Type 301, stainless steel.
         2) Couplings: Heavy-duty, FMG approved.

B. Domestic Water Piping
   1. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
   2. Flanges may be used on aboveground piping, unless otherwise indicated.

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3. Domestic Water Piping: Use any of the following piping materials for each size range:
   a. NPS 1-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
   b. NPS 2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
   c. NPS 2: Hard copper tube, Type L with grooved ends; copper grooved-end fittings; copper-tubing, keyed couplings; and grooved joints.
   d. NPS 2-1/2 to NPS 3-1/2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
   e. NPS 4 to NPS 6: Steel pipe; gray-iron, threaded fittings; and threaded joints.
   f. NPS 4 to NPS 6: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

C. Storm Piping
   1. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
   2. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

D. Aboveground Storm Drainage Piping: Use any of the following piping materials for each size range:
   1. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 301, stainless steel.
      b. Couplings: Heavy-duty, FMG approved.
   2. NPS 2 to NPS 4: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
   3. NPS 2 to NPS 4: Copper DWV tube, copper drainage fittings, and soldered joints.

E. Underground Storm Drainage Piping: Use any of the following piping materials for each size range:
   1. NPS 3 and NPS 4: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.
   2. NPS 3 and NPS 4: Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 301, stainless steel.
      b. Couplings: Heavy-duty, FMG approved.

F. Gas Piping
   1. Use flanges, unions, transition, and special fittings in applications below, unless otherwise indicated.
      a. NPS 1/2 and Smaller: NPS 3/4 steel pipe, malleable-iron threaded fittings, and threaded joints.
      b. NPS 1/2 and Smaller: Soft copper tube, copper fittings, and brazed joints.
      c. NPS 1/2 and Smaller: Corrugated, stainless-steel tubing system and threaded joints.

d. NPS 3/4 and NPS 1: Steel pipe, malleable-iron threaded fittings, and threaded joints.
e. NPS 3/4 and NPS 1: Soft copper tube, copper fittings, and brazed joints.
f. NPS 3/4 and NPS 1: Corrugated, stainless-steel tubing system and threaded joints.
g. NPS 1-1/4 to NPS 4: Steel pipe, malleable-iron threaded fittings, and threaded joints.
h. NPS 1-1/4 to NPS 4: Steel pipe, steel welding fittings, and welded joints.

3.9 VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
1. Shutoff Service: Ball or butterfly valves.
2. Throttling Service: Ball, butterfly, or globe valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves.

3.10 HANGERS AND SUPPORTS APPLICATIONS

A. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

B. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
4. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30.
5. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
6. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
7. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

C. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

D. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

E. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.
   7. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb.
      b. Medium (MSS Type 32): 1500 lb.
      c. Heavy (MSS Type 33): 3000 lb.
   8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
   9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

F. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

G. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
   2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
   3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

3.11 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved water meter with by-pass valves, pressure reducing valve, and sand strainer.

C. Provide new gas service. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

D. Sanitary, Waste and Vent Piping
   1. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
   2. Connect drainage and vent piping to the following:
      a. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
      b. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
      c. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
      d. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

E. Domestic Water Piping
   1. Drawings indicate general arrangement of piping, fittings, and specialties.
   2. Install piping adjacent to equipment and machines to allow service and maintenance.
   3. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
   4. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
      a. Booster Systems: Cold-water suction and discharge piping.
      b. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
      c. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code.
      d. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

F. Storm Piping
   1. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

2. Connect storm drainage piping to roof drains and storm drainage specialties.
3. Connect force-main piping to the following:
   a. Storm Sewer: To exterior force main or storm manhole.
   b. Sump Pumps: To sump pump discharge.

3.12 JOINT CONSTRUCTION

A. Refer to Division 23 for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.13 FIELD QUALITY CONTROL

A. 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.

B. Sanitary, Waste and Vent Piping
1. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
2. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
3. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
4. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
   a. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   b. Prepare reports for tests and required corrective action.
5. Cleaning
   a. Clean interior of piping. Remove dirt and debris as work progresses.
   b. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
   c. Place plugs in ends of uncompleted piping at end of day and when work stops.

C. Domestic Water Piping
1. Inspect domestic water piping as follows:

a. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    2) Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
c. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Test domestic water piping as follows:
    a. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
    b. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    c. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
    d. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
    e. Prepare reports for tests and required corrective action.

3. Cleaning
    a. Clean and disinfect potable domestic water piping as follows:
        1) Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
        2) Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
            (a) Flush piping system with clean, potable water until dirty water does not appear at outlets.
            (b) Fill and isolate system according to either of the following:
                (1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
                (2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

(c) Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
(d) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

b. Prepare and submit reports of purging and disinfecting activities.
c. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

D. Storm Piping
1. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
2. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
3. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
4. Test storm drainage piping according to procedures of authorities having jurisdiction.
5. Cleaning
a. Clean interior of piping. Remove dirt and debris as work progresses.
b. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
c. Place plugs in ends of uncompleted piping at end of day and when work stops.

E. Gas Piping
1. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

END OF SECTION

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water heaters.

1.2 RELATED REQUIREMENTS

A. Section 26 27 26 - Equipment Wiring: Electrical characteristics and wiring connections.

B. Section 22 05 01 - Plumbing General Requirements

1.3 REFERENCE STANDARDS

A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2011.

B. ANSI Z21.10.3 - Gas Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters; 2011.

C. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

D. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

C. Shop Drawings:
   1. Diagram power, signal, and control wiring.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

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E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

D. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.

E. Product Options: Drawings indicate size, profiles, and dimensional requirements of water heaters and are based on specific units indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

G. ANSI Compliance: Provide gas water heaters that comply with ANSI standards for gas water heaters and related products and that bear AGA certification label.

H. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

I. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
   1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
   2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.
   3. Regulatory Requirements: Fabricate and test steam condensate pumps to comply with HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation," and HI 1.6, "Centrifugal Pump Tests."

J. Hydraulic Institute Standards: Design, manufacture and installation of pumps must comply with HI standards.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

1.7 CERTIFICATIONS

A. Water Heaters: NSF approved.

B. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.

C. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.9 WARRANTY

A. See Section 01 77 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 - PRODUCTS

2.1 WATER HEATER MANUFACTURERS

A. Lochinvar: www.lochinvar.com

B. Rinnai Corporation: www.rinnai.us

C. A.O. Smith Water Products Co: www.hotwater.com.

2.2 COMMERCIAL GAS FIRED WATER HEATERS

A. Type: Automatic, natural gas-fired, condensing, vertical storage.

B. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber,

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encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

C. Accessories: Provide:
   1. Water Connections: Brass.
   2. Dip tube: Brass.
   3. Drain Valve.
   4. Anode: Magnesium.
   5. Condensate Neutralization Kit
   6. Concentric Vent Kit

2.4 VENTING AND EXHAUSTING

A. Install system in accordance with water heater manufacturer instructions and with Part 7, Venting of Equipment, National Fuel Gas Code, ANSI Z223.1/NFPA 54.

B. Support pipe at 4 foot intervals to prevent sagging. The water heater is not intended as a support means for the vent.

C. Horizontal exhaust lengths must slope back to the water heater connection at 1/4" per foot to allow condensate to flow back to water heater.

D. Materials
   1. Exhaust: PVC or Stainless steel AL29-4C venting. The exhaust manifold shall have a gravity drain for elimination of the condensation with collecting reservoir.
   2. Condensate trap assembly: Connected to plastic hose (no hard pipe) to allow trap assembly to be removed for maintenance and service. A condensate drain trap is necessary to collect and dispose of the flue gas condensate.

2.5 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves:
   1. Gas Water Heaters: ANSI Z21.22, combination temperature and pressure relief valve.
   2. Oil-Fired Water Heaters: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

B. Pressure Relief Valves:
   1. Gas Water Heaters: ANSI Z21.22 pressure relief valve for storage tanks of 200,000 Btuh.

C. Vacuum Relief Valves:
   1. Gas Water Heaters: ANSI Z21.22.
   2. [Exception: Omit if water heater has integral vacuum-relieving device.]

D. Gas Shutoff Valves: ANSI Z21.15, manually operated. Furnish for installation in piping.

E. Gas Pressure Regulators: ANSI Z21.18, appliance type, factory or field installed. Include pressure rating, capacity, and pressure differential required for water heater and gas supply.

F. Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.

G. Water Heater Stand and Drain Pan Units: High-density-polyethylene-plastic, 18-inch- high, enclosed-base stand complying with IAPMO PS 103 and IAS No. 2. Include integral or separate drain pan with raised edge and NPS 1 drain outlet with ASME B1.20.1, pipe thread.

H. Water Heater Stands: Water heater manufacturer's factory-fabricated, steel stand for floor mounting and capable of supporting water heater and water. Include dimension that will support bottom of water heater a minimum of 18 inches above the floor.

I. Water Heater Mounting Brackets: Water heater Manufacturer's factory-fabricated, steel bracket for water heater mounting and capable of supporting water heater and water.

J. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

K. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that is capable of isolating each water heater and of providing balanced flow through each water heater.

L. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE 90.1 or ASHRAE 90.2.

2.6 PUMPS, GENERAL

A. Description: Factory-assembled and -tested, single-stage, centrifugal pump units; complying with UL 778; suitable for potable-water service; with all-bronze or stainless-steel construction and components in contact with water made of corrosion-resistant materials.

B. Motors: Comply with requirements in Division 23 with built-in thermal-overload protection appropriate for motor size and duty.

C. End Connections for NPS 2 and Smaller: Threaded. Pumps available only with flanged ends may be furnished with threaded companion flanges.

D. End Connections for NPS 2-1/2 and Larger: Flanged.

E. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.

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F. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles.

2.7 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
1. Armstrong Pumps Inc: www.armstrongpumps.com.
2. ITT Bell & Gossett: www.bellgossett.com.

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

2.8 AUTOMATIC CONDENSATE PUMPING UNITS

A. Packaged units with corrosion-resistant pump, plastic tank with cover, and automatic controls. Include factory- or field-installed check valve and a 72-inch-minimum, electrical power cord with plug.
1. Manufacturers:
a. Little Giant Pump Co.
b. Hartell Div.; Milton Roy Co.
c. Marsh Manufacturing, Inc.

2.11 EXPANSION TANKS

A. Pre-charged steel hydro-pneumatic tank with replaceable heavy-duty butyl bladder. The tank shall have NPT epoxy lined system connections and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank must be constructed in accordance with most recent addendum of Section VIII Division 1 of the ASME Boiler and Pressure Vessel Code.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.

C. Pumps:
1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
2. Install pumps with access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
3. Support pumps and piping so weight of piping is not supported by pumps.
4. Suspend in-line pumps independent of piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support pump weight. Fabricate brackets or supports as required.

D. Fuel Fired Domestic Water Heaters
1. Install commercial water heaters on wall.
   a. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
2. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
3. Anchor water heaters to studs.
4. Install and connect gas water heaters according to NFPA 54.
   a. Install appliance, gas pressure regulators on gas-burner inlets of water heaters without pressure regulators.
   b. Install vent piping from gas-train pressure regulators and valves to outside of building where required. Terminate vent piping with brass-screened vent cap fitting. Do not combine vents except with approval of authorities having jurisdiction.
5. Install and connect oil-fired water heaters according to NFPA 31.
6. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
7. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
8. Install vacuum relief valves in cold-water-inlet piping.
9. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 for drain valves.
10. Install thermometers on water heater inlet and outlet piping. Refer to Division 23 for thermometers.
11. Install pressure gages on water heater piping. Refer to Division 23 for pressure gages.
12. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 23 for thermometers.

13. Arrange for insulation on equipment and piping not furnished with factory-applied insulation.
14. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
15. Charge compression tanks with air.

E. Automatic Condensate Pumping Units
1. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

3.2 CONNECTIONS

A. Fuel Fire Domestic Water Heaters
1. Install piping adjacent to machine to allow service and maintenance.
2. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
3. Connect gas piping to gas burner with drip leg, tee, shutoff valve, and union; minimum size same as inlet connection.
4. Connect oil piping to oil burner with shutoff valve and union in supply, and check valve and union in return.
5. Make connections with dielectric fittings where piping is made of dissimilar metal.
6. Gas, Water Heater Vent Connections: Connect to vent system. Include draft hoods and diverters where required. Use vents same size as or larger than water heater outlets, but not smaller than indicated unless smaller vent size has been calculated according to NFPA 54. Comply with gas utility requirements for sizing. Gas vents are specified in Division 23.
7. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service.

B. Pumps
1. Connect water distribution piping to pumps. Install suction and discharge pipe equal to or greater than size of pump nozzles.
2. Install shutoff valve and strainer on suction side of pumps, and check valve and throttling valve on discharge side of pumps. Install valves same size as connected piping.
3. Install pressure gages at suction and discharge of pumps. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps.
4. Electrical wiring and connections are specified in Division 26.
5. Ground equipment.

C. Automatic Condensate Pumping Units
1. Install check valve and gate or ball valve on each condensate pump unit discharge.

3.3 FIELD QUALITY CONTROL

A. Fuel Fired Domestic Water Heaters

1. Engage a factory-authorized service representative to perform startup service and to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

B. In addition to manufacturer's written installation and startup checks, perform the following:
   1. Check for clear relief valve inlets, outlets, and drain piping.
   2. Test operation of safety controls, relief valves, and devices.
   3. Adjust operating controls.
   4. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.
   5. Balance water flow through manifolds of multiple-unit installations.

C. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fuel-fired, domestic water heaters. Refer to Division 1 Closeout Procedures/Demonstration and Training.

END OF SECTION

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SECTION 22 33 00
ELECTRIC, DOMESTIC-WATER HEATERS

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. Tankless, domestic-water heaters.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters 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."

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:
   1. LEED Submittal Requirements: Submit for Sustainability Consultant's review.
      a. A completed GREEN BUILDING MATERIAL CERTIFICATION FORM (GBMCF), as specified in Section 01 81 13 Information to be supplied for this form shall include:
      b. List of all adhesives and sealants installed on the project, within the LEED boundary that were included in the contract.
      c. Cost breakdowns for the materials included in the Contractor or sub-contractor's work. Cost breakdowns shall include total cost plus itemized material costs.
      d. A total estimated weight (lbs.) value of the material applied within the LEED project boundary.
      e. IEQ credit 4, Low Emitting Materials: The VOC content in g/L or applicable certification label for each adhesives, sealants, coatings, paints, etc. per respective LEED requirement.
   2. GBMCF Back-Up Documentation: These documents are used to validate the information provided on the GBMCF (except cost data). For each

material listed on the GBMCF, provide documentation to certify the material's attributes, as applicable:

a. IEQ credit 4, Low Emitting Materials: VOC content or applicable certification label proof in the form of a cutsheet, MSDS, or letter from the manufacturer.

b. Product cut sheets for materials appearing in the GBMCF. Cut sheets shall be submitted with the Contractor or sub-contractor's stamp, as confirmation that the submitted products are the products installed on the Project.

3. Contractor is required to collect all LEED submittal documentation from the project's subcontractors and assemble into one (1) package per Section or trade, on the GBMCF provided, for review by the Sustainability Consultant. Submit GBMCF and Back-Up Documentation within 30 days of awarded contract. Incomplete or inaccurate LEED submittals may be used as the basis for rejecting the submitted products or assemblies.

C. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For commercial domestic-water heaters, 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.

B. Product Certificates: For each type of [**commercial**] [**residential**] [**and**] [**tankless**], electric, domestic-water heater, from manufacturer.

C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Periods: From date of Substantial Completion.
      a. Commercial, Electric, Storage, Domestic-Water Heaters:
      b. Electric, Tankless, Domestic-Water Heaters: Five year(s).

PART 2 - PRODUCTS

2.1 LEED Material Performance

A. IEQ credit 4.1 - Low Emitting Adhesives & Sealants
   1. Adhesives, Sealants and Sealant Primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168. Volatile organic compound (VOC) limits listed in the table below correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.
   2. Aerosol Adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

B. IEQ credit 4.2 - Low Emitting Paints & Coatings
   1. ALL associated site-applied adhesives, grouts, finishes and sealers must be compliant with the respective requirements of IEQc4.1, Adhesives & Sealants and IEQc4.2, Paints & Coatings.

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Bosch.
   b. Hubbell.
   c. Stiebel Eltron, Inc.
   d. Refer to Schedules for Basis if Design.
2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
   a. Connections: ASME B1.20.1 pipe thread.
   b. Pressure Rating: 150 psig.
   c. Heating Element: Resistance heating system.
   d. Temperature Control: Flow-control fitting.
   e. Safety Control: High-temperature-limit cutoff device or system.
   f. Jacket: Aluminum or steel with enameled finish or plastic.
4. Support: Bracket for wall mounting.
5. Capacity and Characteristics:
   a. Refer to Schedules.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Retain second or third option in first paragraph below if domestic-water heaters (possible source of ignition) will be installed in a location where hazardous fumes can accumulate.

B. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.
   1. Maintain manufacturer's recommended clearances.
   2. Arrange units so controls and devices that require servicing are accessible.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Provide code required vacuum relief valves when water heaters are installed above floodrim of fixtures served.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Storm water.
   4. Gas.
      a. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
         1) Notify CM/District not less than two days in advance of proposed utility interruptions.

1.2 SECTION INCLUDES

A. Water closets.

B. Lavatories.

C. Sinks.

1.3 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry

B. Section 07 92 00 - Joint Sealants

C. Section 26 27 26 - Wiring Devices

D. Section 22 10 05 - Plumbing Piping.

E. Section 22 10 06 - Plumbing Piping Specialties.

F. Section 22 30 00 - Plumbing Equipment.

G. Section 22 05 01 - Plumbing General Requirements

1.4 REFERENCE STANDARDS

A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2009.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).

C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2011.

D. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2008.

E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008.

F. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers; 2011.

1.5 SUBMITTALS

A. See Section 012500 - Administrative Requirements, for submittal procedures.

B. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated. Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists. Provide Operation and Maintenence data.

E. Field Quality Control Test Reports

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 78 23 - Operation and Maintenance Instructions

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. All new faucets, including those at sinks in all classrooms, lavatories, and those including bubblers must comply with Health and Safety Code 116875, and must be certified by an independent, accredited third party as being in compliance. Fixtures shall not be accepted until compliance has been proven. Fixtures that fail testing must be replaced.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities";Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
   1. Hand Sinks: NSF 2 construction.
   2. Vitreous-China Fixtures: ASME A112.19.2M.
   3. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
   4. Water-Closet, Flushometer Tank Trim: ASSE 1037.

I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
   1. Faucets: ASME A112.18.1M.
   2. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
   3. NSF Materials: NSF 61.
   4. Pipe Threads: ASME B1.20.1.
   5. Supply and Drain Fittings: ASME A112.18.1M.

J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
   1. Atmospheric Vacuum Breakers: ASSE 1001.
   2. Brass and Copper Supplies: ASME A112.18.1M.
   3. Manual-Operation Flushometers: ASSE 1037.

4. Plastic Tubular Fittings and Piping: ASTM F 409.
5. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
6. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.

K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Floor Drains: ASME A112.21.1M.
2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe Threads: ASME B1.20.1.
6. Plastic Toilet Seats: ANSI Z124.5.
7. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. See Section 01 77 00 - Closeout Procedures or 01 78 36 - Warranties.

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. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
5. Refer to Schedules for make and model numbers.

2.2 FLUSH VALVE WATER CLOSETS, ADA (WC-1 Student)

A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, siphon jet flush action, china bolt caps.
1. MaP Score: 1,000 grams of miso.

2. Flush Volume: 1.28 gallon, maximum.
3. Flush Valve: exposed 1-1/2" top spud.
4. Flush Operation: Manual, oscillating handle.
5. Color: White.
6. Manufacturers:
    a. American Standard, Inc; AFWALL Toilet: www.americanstandard-us.com.
    b. Kohler, Inc; Model K-96059: www.kohler.com
    c. Zurn Industries, Inc; Model Z6515: www.zurn.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Manufacturers:
    a. Sloan Valve Company; Model 111: www.sloanvalve.com.

C. Seats:
1. Manufacturers:
    a. Bemis Manufacturing Company; Model 95SST: www.bemismfg.com.
    b. Zurn Industries, Inc: www.zurn.com.
    c. Substitutions: See Section 01 60 00 - Product Requirements.
2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.3 FLUSH VALVE WATER CLOSETS, ADA, ELEMENTARY (WC-2 Student)

A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, siphon jet flush action, china bolt caps.
1. MaP Score: 1,000 grams of miso.
2. Flush Volume: 1.28 gallon, maximum.
3. Flush Valve: exposed 1-1/2" top spud.
4. Flush Operation: Manual, oscillating handle.
5. Color: White.
6. Manufacturers:
    a. American Standard, Inc; AFWALL Toilet: www.americanstandard-us.com.
    b. Kohler, Inc; Model K-96059: www.kohler.com
    c. Zurn Industries, Inc; Model Z6515: www.zurn.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Manufacturers:
    a. Sloan Valve Company; Model 111: www.sloanvalve.com.

C. Seats:
1. Manufacturers:
    a. Bemis Manufacturing Company; Model 95SST: www.bemismfg.com.

b. Zurn Industries, Inc: www.zurn.com.
c. Substitutions: See Section 016000 - Product Requirements.

2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.4 FLUSH VALVE WATER CLOSETS, ADA, ELEMENTARY (WC-3 Staff)

A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, siphon jet flush action, china bolt caps.
1. MaP Score: 1,000 grams of miso.
2. Flush Volume: 1.28 gallon, maximum.
3. Flush Valve: exposed 1-1/2" top spud.
4. Flush Operation: Manual, oscillating handle.
5. Color: White.
6. Manufacturers:
a. American Standard, Inc; AFWALL Toilet: www.americanstandard-us.com.
b. Kohler, Inc; Model K-96059: www.kohler.com
c. Zurn Industries, Inc; Model Z5665: www.zurn.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Manufacturers:
a. Sloan Valve Company; Model 111: www.sloanvalve.com.

C. Seats:
1. Manufacturers:
a. Bemis Manufacturing Company; Model 95SST: www.bemismfg.com.
b. Zurn Industries, Inc: www.zurn.com.
c. Substitutions: See Section 016000 - Product Requirements.
2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.5 LAVATORIES, ADA (LV-1 Student)

A. Lavatory Manufacturers:
1. American Standard, Inc; Model Lucerne 0356.421 (1-hole): www.americanstandard-us.com.
2. Kohler Company; Model K-12643 (1-hole): www.kohler.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, with 4 inch high back, concealed arms, no troughs. Single center faucet hole.

C. Supply Faucet Manufacturers:

1. Chicago Faucets; Model 333-665PSHVPAABCP: www.chicagofaucets.com.
2. Substitutions: See Section 01 60 00 - Product Requirements.

D. Supply Faucet: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator with maximum flow of 0.35 gallon per minute (low-flow), single lever handle.

E. Supply Faucet: Must be Lead-Free complying with California Health and Safety Code 116875. Plastic parts are not allowed because of bacteriostatic problems and additional maintenance costs.

F. Supply Faucet: Avoid concealed-mount faucets. Spare cartridges to be supplied to SSFUSD Facilities.

G. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and trap arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Wheel handle stops.
4. Carrier:
   a. Manufacturers:
      1) JOSAM Company: www.josam.com.
      2) Zurn Industries, Inc: www.zurn.com.
      3) Substitutions: See Section 01 33 00 Substitituion Procedures.
   b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.6 LAVATORIES, ADA (LV-2 Adult Staff)

A. Lavatory Manufacturers:
1. American Standard, Inc; Model Lucerne 0356.421 (1-hole): www.americanstandard-us.com.
2. Kohler Company; Model K-12643 (1-hole): www.kohler.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, with 4 inch high back, concealed arms, no troughs. Single center faucet hole.

C. Supply Faucet Manufacturers:
1. Chicago Faucets; Model 333-665PSHVPAABCP: www.chicagofaucets.com.
2. Substitutions: See Section 01 60 00 - Product Requirements.

D. Supply Faucet: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator with maximum flow of 0.35 gallon per minute (low-flow), single lever handle.

E. Supply Faucet: Must be Lead-Free complying with California Health and Safety Code 116875. Plastic parts are not allowed because of bacteriostatic problems and additional maintenance costs.

F. Supply Faucet: Avoid concealed-mount faucets. Spare cartridges to be supplied to SSFUSD Facilities.

G. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and trap arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Wheel handle stops.
4. Carrier:
a. Manufacturers:
1) JOSAM Company: www.josam.com.
2) Zurn Industries, Inc: www.zurn.com.
3) Substitutions: See Section 013300 Substitituion Procedures.
b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.7 SINKS, ADA (SK-1)

A. Sink Manufacturers:
1. Elkay; Model LRAD191955: www.elkayusa.com..
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Single Compartment Bowl: ASME A112.19.3; 25 by 17 by 5.5 inch outside dimensions 20 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

C. Faucet Manufactuers:
1. Chicago Faucets; Model 350-E35VP317XKABCP; www.chicagofaucets.com.
2. Substitutions: See Section 01 33 00 Substitution Procedures.

D. Dual Supply Faucet:
1. Deck Mounted 8" Fixed Centers Hot and Cold Water Sink Faucet. 8" Fixed Centers. 5-1/4" Rigid / Swing Gooseneck Spout. 0.5-gpm Aerator. 4" Wristblade Handle. Quaturn Compression Operating Cartridge. 1/2" NPSM Supply Inlets and Coupling Nut for 3/8" or 1/2" Flexible Riser. Provide listed anti-scald thermostatic mixing valve.
E. Provide plaster trap equivalent to Zurn Z-1181.

2.8 SINKS, ADA (SK-2)

A. Sink Manufacturers:
1. Elkay; Model LRAD191955: www.elkayusa.com..
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Single Compartment Bowl: ASME A112.19.3; 25 by 17 by 5.5 inch outside dimensions 20 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

C. Faucet Manufactuers:
1. Chicago Faucets; Model 350-E35VP317XKABCP; www.chicagofaucets.com.
2. Substitutions: See Section 01 33 00 Substitution Procedures.

D. Dual Supply Faucet:
1. Deck Mounted 8" Fixed Centers Hot and Cold Water Sink Faucet. 8" Fixed Centers. 5-1/4" Rigid / Swing Gooseneck Spout. 0.5-gpm Aerator automatic type, battery powered, electronic sensor operated, mixing, solid brass valve, rigid spout. Quaturn Compression Operating Cartridge. 1/2" NPSM Supply Inlets and Coupling Nut for 3/8" or 1/2" Flexible Riser. Provide listed anti-scald thermostatic mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
E. Provide plaster trap equivalent to Zurn Z-1181.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install wall-hanging fixtures with tubular waste piping attached to supports.

C. Install counter-mounting fixtures in and attached to casework.

D. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
   1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture.

F. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

G. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

H. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

I. Install toilet seats on water closets.

J. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

K. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

L. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

M. Install traps on fixture outlets.
   1. Exception: Omit trap on fixtures with integral traps.

N. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 23 for escutcheons.

O. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 23 for sealant and installation requirements.

P. Connect water supplies from water distribution piping to fixtures.

Q. Connect drain piping from fixtures to drainage piping.

R. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

S. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps,

and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

T. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.

U. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

V. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation.

W. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

X. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 23 for escutcheons.

Y. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant.

Z. Match sealant color to fixture color. Refer to Section 079200 for sealant and installation requirements.

AA. Adjust drinking fountain/water cooler flow regulators for proper flow and stream height. AD. Install each fixture with trap, easily removable for servicing and cleaning.

BB. Install components level and plumb.

CC. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture. AG. Seal fixtures to wall and floor surfaces with sealant as specified in Section 079200, color to match fixture.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 00
HVAC AND PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The requirements of the General Conditions, Supplementary Conditions, And Division 1, General Requirements, apply to the Work of this section.

1.2 SUMMARY

A. Work Included: Furnish and install a complete, fully automatic heating, ventilating and air conditioning (HVAC) system as described by the complete set of specifications and project drawings. The HVAC systems and design described in the project documents reflect a low energy building design. Any modifications to the systems described herein should be improvements on the sustainability and energy efficiency of the project, to the greatest extent possible. All design modifications that pertain to system selection, system energy efficiency and energy use, material selection and indoor air quality issues shall require the approval of Integral group.

B. CALGreen Commissioning: The scope of work for the mechanical contractor shall not include the duties of the Commissioning Agent. The mechanical contractor will be required, however, to include in their scope of work mechanical duties relevant to the commissioning process, including but not limited to training of owner's personnel in the operation of the HVAC equipment, providing manufacturer's startup and prefunctional checklists and contractor provided prefunctional and startup checklists to commissioning agent, performing and documenting prefunctional checklists for HVAC equipment, performing and documenting functional checklists for HVAC equipment and providing operations and maintenance manuals.

1.3 CODES AND STANDARDS

A. All work and materials shall be in full accordance with the latest local rules and regulations, applicable sections of the California Code of Regulations, Title 24, State Fire Marshal, the Safety Orders of the Division of Industrial Safety, the California Electric Code and applicable State requirements. Nothing in these Plans and Specifications is to be construed to permit work not conforming to these requirements.

B. Wherever the Specifications call for or describe materials or construction of better quality or larger sizes than are required by the above rules and regulations, these Specifications shall govern. Should there be any direct conflict between the above rules and regulations and the specifications the rules shall govern.

C. Equipment shall have U.L. label listing.

1.4 DRAWINGS

A. Layout of the equipment and work is generally diagrammatic, unless specifically dimensioned. Drawings and details shall be checked for interferences before installing the work. Any interference noted between different drawings, and between drawings and actual field conditions shall be brought to the Architect's attention for a decision. There shall be no additional compensation for interfering work that was performed prior to checking interferences and field conditions. The right is reserved to make any reasonable change in location of equipment without involving additional expense to the Owner.

B. All dimensions and locations of mechanical equipment, doors, partitions, etc., are to be taken from the architectural plans but shall be verified at the site.

1.5 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Submit shop drawings, a list of proposed material and equipment manufacturers and the names of Subcontractors.

C. Shop drawings shall be provided for all plumbing and mechanical systems for all floors of the building. Plumbing and mechanical shop drawings shall also be provided for the underslab systems (under the foundation slab).

D. Materials and methods with which the words "for approval" or "approved" are used, and materials and methods which differ from those specified, shall be submitted.

E. Prepare and submit shop drawings, sections, details and diagrams to minimum scale 1/4" = 1'-0". Pump rooms and mechanical rooms shall be 1/2" = 1'-0" minimum scale. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, fire protection, and electrical in relation to architectural and structural features. Include minor

F.

G. piping, drains, air vents, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, dampers, etc. Electronic submittal is encouraged.

H. Shop drawings shall be created and submitted on the latest version of 3D AutoCAD.

I. Submit manufacturer's specifications, data sheets, certified equipment drawings and installation instructions, including installation dimensions, clearances, weights, materials, finishes, color selection, accessories, acoustical characteristics, capacity and full load and part load performance curves; complete with electrical data, motor horse power, KW; motor efficiency, amperage, voltage phases and wiring diagrams. Identify the specific specification number, paragraph and equipment identification number per equipment schedule.

J. Certified Equipment Drawings (8-1/2" x 11" sheets) shall be indexed in accordance with Specification Section. Drawings to be submitted at a later date shall be marked with a page as a placeholder for insertion when submitted. The original submittal shall note which shop drawings will be submitted later. Marked-up catalogs are not acceptable and will be rejected. Electronic submittal is encouraged.

K. Electronic submittals in PDF format are required, submittal review comments will be provided in electronic format, with pertinent markups as needed. All submittals and equipment datasheets submitted to the engineer in PDF format shall be text searchable. Submittals shall be reproduced on both sides of each sheet of paper when paper submittals are required, to as great an extent as is reasonable in order to reduce paper waste. At the discretion of the engineer, the submittals shall be provided in paper sets only.

L. All final approved submittals and equipment datasheets shall be provided, in PDF format, to the owner as part of the as-built drawing set and shall be text searchable.

1.6 COORDINATION DRAWINGS

A. Utilize the latest version of 3D AutoCAD, Navisworks, and/or Revit software for the coordination efforts. No proprietary software of any kind shall be used other than that indicated. Drawing paper size shall not be larger than FULL SIZED Contract documents, and in no case larger than 30" x 42". Coordinate available space with ALL other trades involved.

B. These drawings are to show registers, grilles, diffusers, duct sizes, elevation of bottom of duct, pipe sizes, valves and accessories, elevation of bottom of pipe, all elevations of materials and/or systems throughout each floor inclusive of hanger components, seismic bracing if applicable, and any component of construction that impacts vertical and/or horizontal space. In addition, the locations of all valves, dampers, and other items requiring access for service and maintenance are to be shown. The drawings are to also show electrical, beams, architectural bracing, structural bracing, ceiling heights, access doors, walls, floor to floor dimensions, columns, doors and other major architectural and structural features as shown on the architectural and structural drawings. Where the routing of work differs from that indicated on the contract documents, such areas are to be indicated by highlighting.

C. Rerouting of any system or part thereof shall be submitted separately in order to obtain concurrence of the Architect/Engineer/Owner. Submitted rerouting must include fully documented proposed solutions with all trades coordinated. Contractor is fully responsible for coordination of systems included herein. Any effort by Architect/Engineer beyond answering contractor's questions will be at contractor's expense, including attending coordination meetings, review of interim plans, or review of incomplete questions (routing issues without suggested solutions).

D. The contractor and subcontractors are responsible to review and resolve any real or apparent interferences or conflicts as indicated by the coordination drawings produced by each trade.

E. After all conflicts or interferences are resolved, develop a final composite drawing showing the agreed upon routing, layout and juxtaposition of all duct work, conveyers, piping, major conduit, valves, panels, lighting fixtures and all other major mechanical and electrical installations. In the preparation of all the final Coordination Drawings, large scale details as well as cross and longitudinal sections are required to fully delineate all conditions.

F. Submit the Coordination Drawings (electronic submittal encouraged) to the design professional for review and comment, as indicated under "Shop Drawings" above.

G. No extra compensation will be paid for relocating any duct, pipe, conduit, or other material that has been installed without proper coordination between all trades involved. If any improperly coordinated work, or installed work that is not in accordance with the approved coordination composites, or is specifically noted by the Architect/Engineer for a valid reason, necessitates additional work by the other trades, the costs of all such additional work is to be borne solely by the CONTRACTOR.

H. All changes in the scope of work due to revisions formally issued and approved are to be shown on both the individual subcontractor's Shop Drawings and the Coordination Drawings.

1.7 MATERIALS AND SUBSTITUTIONS

A. Comply with Section 01 33 00 - Substitution Procedures.

B. Shop drawings of proposed material and equipment that differ from the specified materials and equipment, shall be accompanied by drawings that define changes. These drawings shall show modifications of architectural, plumbing, electrical and mechanical work required by the proposed materials and equipment, such as relocation of flues, drains, revised electrical circuits, relocation of roof or wall penetrations, revised foundations, etc.

1.8 COORDINATION WITH OTHER WORK

A. Under the work in this Section become thoroughly familiar with the drawings for work in other Sections and adjust the work to conform with the conditions shown on these drawings to provide the best possible assembly of the combined work.

B. Obtain necessary information from the other trades regarding location of their work in order that the work in this Section may be placed in correct position.

C. The inclusion and proper location of supports, pads, sleepers, openings, anchorages, etc. provided by others is the responsibility of the Contractor under this Section. Cutting and/or boring shall be permitted under this Section only with the written approval of the Architect.

D. It shall be the Contractor's responsibility to coordinate and have provided by other trades where not covered by the Contractor's scope of work, all electrical wiring

and power to equipment, controls and devices, all plumbing and any other work from other trades as required to provide fully functioning HVAC systems per the contract documents.

1.9 MANUFACTURER'S DIRECTIONS

A. Manufacturer's directions shall be followed in cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and Specifications.

1.10 PROTECTION OF WORK

A. Until final acceptance of the work, protect materials from damage and provide adequate and proper storage facilities. Replace damaged or defective work, material, and equipment before requesting final acceptance.

1.11 WORKMANSHIP

A. Equipment and materials shall be installed in a neat and workmanlike manner. Materials and equipment not so installed shall, upon order of the Architect, be removed and replaced in a satisfactory manner, without change in contract price.

1.12 CLOSING IN UNINSPECTED WORK

A. Do not allow or cause any work to be covered up or enclosed until it has been inspected, tested, and accepted by the Architect and the Owner's Engineer.

B. Any work enclosed or covered-up prior to inspection and testing shall be uncovered. After the work has been tested, inspected and accepted, repair such materials as may be necessary to restore disturbed work to its original and proper condition at no extra cost to the Owner.

1.13 EQUIPMENT ANCHORING

A. Equipment shall be securely anchored to the building structure to prevent shifting or overturning during earthquakes.

1.14 DEFINITIONS

A. A.S.T.M. where referred to in this Specification, means the American Society for Testing Materials.

B. A.G.A. means the American Gas Association.

C. A.S.M.E. refers to the American Society of Mechanical Engineers.

D. A.S.H.R.A.E. refers to the American Society of Heating Refrigeration and Air Conditioning Engineers.

E. S.M.A.C.N.A. refers to the Sheet Metal and Air Conditioning Contractors National Association.

F. A.N.S.I. refers to the American National Standards Institute.

G. A.A.B.C. refers to the Associated Air Balance Council.

H. C.E.C. refers to the California Energy Commission.

1.15 PRELIMINARY OPERATION

A. Under this section, supervise and direct preliminary operation of systems should the Owner demand that any portion of the plant, apparatus, or equipment be operated previous to the final completion and acceptance of the work. Expenses will be paid by the Owner. Such preliminary operation or payment shall not be construed as an acceptance of the work.

1.16 CUTTING AND OPENINGS

A. Comply with Section 01 73 29 - Cutting and Patching.

1.17 "AS-BUILT" DRAWINGS

A. Comply with Section 01 77 00 - Project Closeout.

B. As-built drawings shall be furnished in an electronic format AutoCAD Release 2007 or later.

1.18 FINAL INSPECTION

A. At the time of final inspection, a service representative shall be available to make final adjustments.

1.19 FINAL OPERATION

A. After acceptance of the installation, instruct the Owner's representative in operation and maintenance, for a period of three (3) working days at a time requested by the Owner during the first year of guarantee.

B. At the beginning of the instruction period, deliver to the Owner three (3) copies of a durable binder as described under "Operating Instructions".

1.20 OPERATING INSTRUCTIONS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the GC for inclusion in the O&M manuals prior to the training of owner personnel.

C. Provide six (6) complete sets of Operating Instructions. These instructions shall include brochures, diagrams, maintenance, and operating instructions and parts lists. See "Final Operation".

D. A summary of operating sequences (start-up, normal run, and shut-down), and control diagrams shall be provided in the main mechanical room.

E. The commissioning agent shall receive a copy of the O&M manuals for review.

1.21 TRAINING OF OWNER PERSONNEL

A. The GC (General Contractor) shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. The CA (Commissioning Agent) shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:
   1. Provide the CA with a training plan two weeks before the planned training.
   2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, air conditioning units, air handling units, fans, boilers, terminal units, controls, water treatment systems, etc.
   3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
   4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
   5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
   6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
   7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
   8. Training shall include:
      a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
      b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.

c. Discussion of relevant health and safety issues and concerns.
d. Discussion of warranties and guarantees.
e. Common troubleshooting problems and solutions.
f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
g. Discussion of any peculiarities of equipment installation or operation.
h. The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1-1989R, 1996 is recommended.
i. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate. A video record of the training session is required.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

D. Controls Contractor. The controls contractor shall have the following training responsibilities:
1. Provide the CA with a training plan two weeks before the planned training.
2. The controls contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.
3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Manuals will be approved by the CA. Copies of audiovisuals shall be delivered to the Owner.
4. The trainings will be tailored to the needs and skill-level of the trainees.
5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. The Owner shall approve the instructor prior to scheduling the training.
6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
7. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
8. Training sessions:
a. Training I. Control System. The first training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student,

using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

b. Training II. Building Systems. The second session shall be held on-site and consist of actual hands-on training after the completion of system commissioning. The session shall include instruction on the following systems:
   1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
   2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
   3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
   4) Every screen shall be completely discussed, allowing time for questions.
   5) Use of keypad or plug-in laptop computer at the zone level.
   6) Use of remote access to the system via phone lines or networks.
   7) Setting up and changing an air terminal unit controller.
   8) Graphics generation
   9) Point database entry and modifications
   10) Understanding DDC field panel operating programming (when applicable)

E. TAB Contractor.The TAB contractor shall have the following training responsibilities:
   1. TAB contractor shall meet with facility staff after completion of TAB and instruct them on the following:
      a. Go over the final TAB report, explaining the layout and meanings of each data type.
      b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
      c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
      d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
      e. Other salient information that may be useful for facility operations, relative to TAB.

1.22 WARRANTY

A. Comply with 01 77 00 - Closeout Procedures.

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B. Equipment under this section of the specifications shall be guaranteed for a period of one year from date of acceptance against defective materials, design and workmanship.

C. Contractor shall leave entire installation in complete working order and free from defects in material, workmanship or finish.

D. The HVAC contractor, by accepting these specifications and by signing the Sub-contract, shall guarantee the following:
   1. All equipment, material, and workmanship against defects in material and workmanship for a period of one (1) year from date of final acceptance by the Owner. The HVAC contractor shall furnish written guarantee to replace defective work and materials furnished under this Section, at no cost to the Owner, for this one (1) year period.
   2. That equipment and material will produce the results specified.

E. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding the guarantees or relieving responsibility during the guarantee period.

F. Provide, at no cost to the Owner, one service mechanic for an 8-hour period after a period of 90 calendar days from date of acceptance of systems by Owner to repair, replace any latent deficiency.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 23 05 13
23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.2 RELATED REQUIREMENTS

A. Section 262726 - Wiring Devices: Electrical characteristics and wiring connections.

B. Section 230548 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 230553 - Identification for HVAC Piping and Equipment

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; Institute of Electrical and Electronic Engineers; 2004.

C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

D. NFPA 70 - National Electrical Code; National Fire Protection A ssociation; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 012500 - Submittal Procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

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F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALITY ASSURANCE

A. Conform to NFPA 70.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of high efficiency motors.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.7 WARRANTY

A. See Section 017700 - Closeout Procedures, for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 10 horsepower.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Common Motors:
1. General Electric
2. Westinghouse
3. Baldor Electric Company
4. Reliance Electric
5. Variable Frequency Motors
6. ABB
7. Siemens
8. General Electric
9. Danfoss
10. Yaskawa
11. Mitsubishi

B. Substitutions: See Section 013300 - Substitution Procedures.
1. Only if performance and quality equivalency can be evidenced.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service:

1. Motors 1/2 HP: 208 volts, three phase, 60 Hz or per schdule; all motors called out as VFD equipped to be three phase. Maximum motor speed of 1750 RPM, unless otherwise noted.
2. Motors Larger than 1/2 Horsepower: 208 volts, three phase, 60 Hz.

B. Construction:
1. Open drip-proof type except where specifically noted otherwise.
2. Design for continuous operation in 40 degrees C environment.
3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
4. Motors exposed to the outside air stream (whether inside or outside of equipment) to be totally enclosed, fan cooled (TEFC) motors.
5. Motors for belt drive to have adjustable bases with set screw to maintain belt tension.

C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

D. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.

2.4 ELECTRICALLY COMMUTATED MOTORS

A. Motor shall be brushless DC type specifically designed for fan applications with heavy duty ball bearings and electronic commutation. It shall contain internal circuitry that converts 115 volt single phase power into a DC signal. The motor shall be speed controllable down to 20% of full speed. Speed control is achieved through either a potentiometer dial mounted on the exterior of the motor housing, or a 0-10 volt control signal input through the pre wired controls wires. Motor shall be a minimum of 85% efficient at all speeds.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

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SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Equipment support bases.

B. Vibration isolators.

C. Vibration isolators.

D. Seismic restraints.

1.2 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2013.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013.

C. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2013.

D. SMACNA (SRM) - Seismic Duct Restraint Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2013.

1.3 PERFORMANCE REQUIREMENTS

A. Equipment assemblies and equipment anchorages shall be capable of supporting combined gravity and lateral loads, and shall be positively anchored to the structure.

B. Design of equipment assemblies and equipment anchorages shall employ the following seismic design criteria:
   1. Seismic Anchorage: Equipment shall be anchored or otherwise secured to the structure in conformance with section 13.6 of ASCE 7-10 (American Society of Civil Engineers) "Minimum Design Loads of Buildings and Other Structures" and the following parameters:
      a. ap = per table 13.6.1 of ASCE 7-10
      b. Rp = per table 13.6.1 of ASCE 7-10

1.4 SUBMITTALS

A. See Section 012500 - Submittal Procedures.

B. Product Data: Provide schedule of vibration isolator type with location and load on each.

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C. For equipment that is contractor supplied or is substituted for those that are specified, provide structural calculations for equipment anchorage to the structure, sealed and signed by a civil engineer registered in the State of California, demonstrating conformance with section 13.6 of ASCE 7-10 (American Society of Civil Engineers) "Minimum Design Loads of Buildings and Other Structures".

D. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Indicate seismic control measures.

E. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:
   1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
   2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
   3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
   4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
   5. Details for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.

F. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mason Industries: www.mason-ind.com.

B. Substitutions: See Section 013300 - Substituion Procedures.

2.2 PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
   2. Steel springs to function without undue stress or overloading.

2.3 EQUIPMENT SUPPORT BASES

A. Structural Bases:

B. Construction: Engineered, structural steel frames with welded brackets for side mounting of the isolators.

C. Frames: Square, rectangular or T-shaped.

D. Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

E. Applications: Adjustable motor slide rails for centrifugal fans.

2.4 SEISMIC VIBRATION ISOLATORS

A. Seismic Type:
   1. Coil Springs Consisting of Single Elements:
      a. Housing: Manufactured from cast iron material.
      b. Ductile Material: Designed and rated for seismic applications.
      c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
      d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
      e. Resilient Pad: Located in series with spring.
      f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
      g. Finish: Suitable for the application.
   2. All Directional Elastomeric:
      a. Material: Molded from oil, ozone, and oxidant resistant compounds.
      b. Operating Parameters: Designed to operate within the isolator strain limits providing maximum performance and service life.
      c. Attachment Method: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
      d. Rating: Cast iron and aluminum housings rated for seismic restraint applications.

B. Minimum Operating Static Deflections: Deflections indicated in project documents are not to exceed published load capacities.

2.5 SEISMIC RESTRAINTS FOR SUSPENDED COMPONENTS AND EQUIPMENT

A. Comply with:
   1. ASHRAE Handbook - HVAC Applications 2. 2013 CBC
   2. 3. SMACNA - Seismic Duct Restraint Manual

B. Cable Restraints:
   1. Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.

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2. Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.
3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
4. Connections:
   a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
   b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
5. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

C. Rigid Restraints:
1. Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

2.6 VIBRATION ISOLATORS

A. Open Spring Isolators:
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch-thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

B. Restrained Open Spring Isolators:
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

C. Closed Spring Isolators:
1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.

D. Elastomeric Hanger:
1. Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

E. Spring Hangers:
1. Combination coil-spring and elastomeric-insert hanger with spring and insert in compression
2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

F. Pipe Riser Resilient Support:
1. All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

G. Resilient Pipe Guides:
1. Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

H. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

I. Resilient Isolation Washers and Bushings:
   1. 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 40, plus or minus 5, with a flat washer face.

J. Restraining Cables:
   1. Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.

K. Anchor Bolts:
   1. Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

3.2 INSTALLATION – SEISMIC

A. Comply with:
   1. ASHRAE Handbook - HVAC Applications
   2. SMACNA - Seismic Duct Restraint Manual

B. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
   1. Install equipment anchorage items designed to resist seismic design force in any direction.
   2. Install vibration and seismic controls designed to include base and isolator requirements.
   3. Provide flexible connections between equipment and interconnected piping.
   4. Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.
   5. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.
   6. Where concrete floor thickness is less than required for expansion anchor installation, install through bolt in lieu of expansion anchor.
   7. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, install supplemental framing or blocking to transfer loads to structural elements.

C. Suspended Mechanical Equipment:
   1. Provide supports and bracing to resist seismic design force in any direction.

2. Provide flexible connections between equipment and interconnected piping.
3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
4. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

D. Wall mounted Mechanical Equipment:
1. Provide support and bracing to resist seismic design force in any direction.
2. Install backing plates or blocking as required to deliver load to primary wall framing members.
3. Anchoring to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads is not permitted.

E. Piping:
1. Provide seismic bracing in accordance ASC 7.
2. Provide supports, braces, and anchors to resist gravity and seismic design forces.
3. Provide flexible connections between floor mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.
4. Provide 1" flexible connection at all wall penetrations and risers.
5. Brace resiliently supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to the structure.
6. Brace every run 5.0 feet or more in length with two transverse and one longitudinal bracing locations.
7. Pipes and Connections Constructed of Ductile Materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections):
   a. Provide transverse bracing at spacing not more than 40.0 feet on center.
   b. Provide longitudinal bracing at spacing not more than 80.0 feet on center.
8. Pipes and Connections Constructed of Non Ductile Materials (cast iron, no-hub, plastic or non-UL listed grooved coupling pipe):
   a. Provide transverse bracing at spacing not more than 20.0 feet on center.
   b. Provide longitudinal bracing at spacing not more than 40.0 feet on center.
9. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.
10. Piping Explicitly Exempt from Seismic Bracing Requirements:
   a. Install piping consistent with ASCE 7, such that swinging of the pipes will not cause damaging impact with adjacent components, finishes, or structural framing while maintaining clear horizontal distance of 67 percent of the hanger length between subject components.
   b. Provide swing restraints as required to control potential impact due to limited space between subject components.

11. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

F. Ductwork:
1. Provide seismic bracing for ducts with cross sectional area greater than 6 sq ft (independent of duct contents).
2. Provide seismic bracing for all ducts containing hazardous materials.
3. Provide supports, braces, and anchors to resist gravity and seismic design forces.
4. Install ducts and duct risers designed to accommodate interstory drift.
5. Independently support in-line devices weighing more than 20 pounds.
6. Independently support and brace all in-line devices weighing more than 75 pounds.
7. Provide unbraced piping attached to braced in-line equipment with adequate flexibility to accommodate differential displacements.
8. Positively attach dampers, louvers, diffusers and similar appurtenances to ductwork with mechanical fasteners.
9. Install duct supports designed to resist not less than 150 percent of the duct weight.
10. The use of power driven fasteners is prohibited in the hanging of ducts weighing over 10 pounds per lineal foot for seismic design categories D, E, and F.
11. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an IAS AC172 accredited inspection body or otherwise accepted by applicable codes is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

3.3 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report. Include static deflections.

B. Test isolator deflection.

C. Inspect minimum snubber clearances.

3.4 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

E. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

END OF SECTION

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SECTION 23 05 50
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Sleeves.
   5. Escutcheons.
   6. Grout.
   7. Equipment installation requirements common to equipment sections.
   8. Concrete bases.
   9. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

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B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining Plastic Piping:
   1. ABS Piping: ASTM D 2235.
   2. CPVC Piping: ASTM F 493.
   3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   4. PVC to ABS Piping Transition: ASTM D 3138.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
   1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
1. Finish: Polished chrome-plated.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, 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.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are encouraged in mechanical rooms, along with diagonal placement and location of pump and equipment inlets and outlets, in order to minimize the number of 90 bends. Diagonal runs are discouraged in other areas, unless specifically indicated otherwise.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors.

L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

M. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
   3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

N. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Verify final equipment locations for roughing-in.

P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: 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 appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
   2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
   3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   5. PVC Nonpressure Piping: Join according to ASTM D 2855.
   6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
   1. Plain-End Pipe and Fittings: Use butt fusion.
   2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
   4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 RELATED REQUIREMENTS

A. Section 09 91 00 - Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Furnace Units: Nameplates.

B. Air Terminal Units: Tags.

C. Automatic Controls: Tags. Key to control schematic.

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D. Control Panels: Nameplates.

E. Dampers: Ceiling tacks, where located above lay-in ceiling.

F. Ductwork: Nameplates.

G. Instrumentation: Tags.

H. Major Control Components: Nameplates.

I. Piping: Tags.

J. Small-sized Equipment: Tags.

K. Thermostats: Nameplates.

L. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A. Manufacturers:
1. Seton Identification Products: www.seton.com.
2. Substitutions: See Section 01 33 00 - Substitution Procedures.
3. Letter Color: White.
4. Letter Height: 1/4 inch.
5. Background Color: Black.
6. Plastic: Conform to ASTM D709.

2.3 TAGS

A. Manufacturers:
1. Brady Corporation: www.bradycorp.com.
2. Seton Identification Products: www.seton.com.
3. Substitutions: See Section 01 33 00 - Substitution Procedures.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Manufacturers:
1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 01 33 00 - Substitution Procedures.

B. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

2.5 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradycorp.com.
   2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   3. MIFAB, Inc.: www.mifab.com.
   4. Seton Identification Products: www.seton.com.
   5. Substitutions: See Section 01 33 00 - Substitution Procedures.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Color code as follows:
   1. Gas: Yellow with black letters.

2.6 CEILING TACKS

A. Manufacturers:
   1. Craftmark: www.craftmarkid.com.
   2. Substitutions: See Section 01 33 00 - Substitution Procedures.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Heating/Cooling Valves: Blue.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 91 00 - Painting, for stencil painting

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 91 00 - Painting.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

G. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Measuring electrical performance of HVAC equipment.

D. Setting quantitative performance of HVAC equipment.

E. Verifying that automatic control devices are functioning properly.

F. Sound measurement of equipment operating conditions.

G. Vibration measurement of equipment operating conditions.

H. Reporting results of activities and procedures specified in this Section.

I. Commissioning activities.

1.2 RELATED REQUIREMENTS

A. Section 014100 - Regulatory Requirements: Employment of testing agency and payment for services.

1.3 PRICE AND PAYMENT PROCEDURES

A. Allowance includes testing, adjusting, and balancing of mechanical systems.

1.4 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.5 SUBMITTALS

A. See Section 012500 - Submittal Procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit 3 weeks prior to starting the testing, adjusting, and balancing work.
   2. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Detailed step-by-step procedures for TAB work for each system and issue, including:
         1) Terminal flow calibration (for each terminal type).
         2) Diffuser proportioning.
         3) Branch/submain proportioning.
         4) Total flow calculations.
         5) Rechecking.
         6) Diversity issues.
      f. Expected problems and solutions, etc.
      g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
      h. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
      i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
      j. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
      k. Method of checking building static and exhaust fan and/or relief damper capacity.
      l. Methods for making coil or other system plant capacity measurements, if specified.
      m. Time schedule for TAB work to be done in phases (by floor, etc.).
      n. Description of TAB work for areas to be built out later, if any.
      o. Time schedule for deferred or seasonal TAB work, if specified.
      p. False loading of systems to complete TAB work, if specified.
      q. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

r. Interstitial cavity differential pressure measurements and calculations, if specified.
s. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
t. Procedures for formal progress reports, including scope and frequency.
u. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least twice a week to Construction Manager.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Progress Reports.
1. As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies 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.

F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Submit under provisions of Section 014100 - Regulatory Requirements.
2. Submit to the Construction Manager and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
3. Revise TAB plan to reflect actual procedures and submit as part of final report.
4. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
5. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
6. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
7. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing agent.
8. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
9. Units of Measure: Report data in both I-P (inch-pcund) and SI (metric) units.
10. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.

e. Project location.
f. Project Architect.
g. Project Engineer.
h. Project Contractor.
i. Project altitude.
j. Report date.

11. In addition to certified field report data, include the following:
    a. Fan curves.
    b. Manufacturers' test data.
    c. Field quality-control test reports prepared by system and equipment installers.
    d. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
12. Signature of testing, adjusting, and balancing Agent who certifies the report.
13. Summary of contents, including the following:
    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
14. Notes to explain why certain final data in the body of reports vary from design values.
15. Test conditions for fans and pump performance forms, including the following:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Face and bypass damper settings at coils.
    d. Fan drive settings, including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance
16. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
    a. Quantities of outside, supply, return, and exhaust airflows.
    b. Duct, outlet, and inlet sizes.
    c. Pipe and valve sizes and locations.
    d. Terminal units.
    e. Balancing stations.
17. Title 24 Acceptance Tests: Perform all functions and tests required by Title 24 acceptance tests. Identify and make any system adjustments to achieve acceptance testing objectives. Complete acceptance testing forms and submit to Engineer and General Contractor.

G. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify testing, adjusting, and balancing field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
   2. Certify that testing, adjusting, and balancing team complied with approved testing, adjusting, and balancing plan and procedures specified and referenced in this Specification.

C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards or Testing, Adjusting and Balancing."

D. Instrumentation Type, Quantity and Accuracy: As described in AABC national standards.

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by the instrument manufacturer.

3.2 COORDINATION

A. Coordinate efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

C. If another round of pressure testing of the raised floor assembly is required after the first testing, verify that all trades have completed their work to mitigate areas of leakage before commencing additional test.

3.3 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

C. The certified Agent has tested and balanced systems according to the Contract Documents.

D. Systems are balanced to optimum performance capabilities within design and installation limits.

3.4 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
   5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.5 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Examine the Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
   2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
   3. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
   4. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
   5. Systems are started and operating in a safe and normal condition.
   6. Temperature control systems are installed complete and operable.

7. Proper thermal overload protection is in place for electrical equipment.
8. Final filters are clean and in place. If required, install temporary media in addition to final filters.
9. Duct systems are clean of debris.
10. Fans are rotating correctly.
11. Fire and volume dampers are in place and open.
12. Examine equipment for installation and for properly operating safety interlocks and controls
13. Access doors are closed and duct end caps are in place.
14. Air outlets are installed and connected.
15. Duct system leakage is minimized.
16. Service and balance valves are open.
17. Examine equipment performance data, including fan curves. 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. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with design data and installed conditions.
18. Examine automatic temperature system components to verify the following:
    a. Dampers, valves, and other controlled devices operate by the intended controller.
    b. Dampers and valves are in the position indicated by the controller.
    c. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
    d. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
    e. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
    f. Sensors are located to sense only intended conditions.
    g. Sequence of operation for control modes is according to the Contract Documents.
    h. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
    i. Interlocked systems are operating.
    j. Changeover from heating to ventilation only mode occurs according to design values

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.6 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

D. Complete system readiness checks and prepare system readiness 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 design conditions for system operations can be met

3.7 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.8 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

G. Check and adjust systems approximately six months after final acceptance and submit report.

3.9 GENERAL PROCEDURES

A. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

B. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings

3.10 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

N. Once the first air leakage test has occurred for the raised floor system, if the resulting air leakage documented is greater than the allowable range, the TAB contractor shall perform one additional air leakage test in those zones that had failed to meet the air leakage requirement, after the subcontractors have mitigated the identified air leakage areas. This one additional test shall be included in the TAB contractor's scope of work. If additional tests are required beyond this, the TAB contractor shall perform any additional duct leakage tests at the expense of the subcontractor who bears responsibility for the mitigating the additional duct leakage in this area.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

3.12 COMMISSIONING

A. This section applies if CALGreen Commissioning is required by the AHJ.

B. Perform prerequisites prior to starting commissioning activities.

C. Fill out Prefunctional Checklists for:
   1. Air side systems.

D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

E. In the presence of the Commissioning Authority, verify that:
   1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least

one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

F. No seasonal tests are required.

G. No further monitoring is required.

H. No deferred testing is required.

3.13 SCOPE

A. Test, adjust, and balance the following:
   1. Plumbing Pumps
   2. Forced Air Furnaces
   3. Fans
   4. Air Filters
   5. Air Inlets and Outlets

3.14 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer
   2. Model/Frame
   3. HP/BHP
   4. Phase, voltage, amperage; nameplate, actual, no load
   5. RPM
   6. Service factor
   7. Starter size, rating, heater elements
   8. Sheave Make/Size/Bore

B. V-Belt Drives:
   1. Identification/location
   2. Required driven RPM
   3. Driven sheave, diameter and RPM
   4. Belt, size and quantity
   5. Center to center distance, maximum, minimum, and actual

C. Pumps:
   1. Identification/number
   2. Manufacturer
   3. Size/model
   4. Impeller
   5. Service
   6. Design flow rate, pressure drop, BHP
   7. Actual flow rate, pressure drop, BHP
   8. Discharge pressure
   9. Suction pressure
   10. Total operating head pressure
   11. Shut off, discharge and suction pressures

12. Shut off, total head pressure

D. Combustion Equipment:
   1. Furnace manufacturer
   2. Serial number
   3. Firing rate
   4. Overfire draft
   5. Gas meter timing dial size
   6. Gas meter time per revolution
   7. Gas flow rate
   8. Heat input
   9. Burner manifold gas pressure
   10. Percent carbon monoxide (CO)
   11. Percent carbon dioxide (CO2)
   12. Percent oxygen (O2)
   13. Percent excess air
   14. Flue gas temperature at outlet
   15. Ambient temperature
   16. Net stack temperature
   17. Percent stack loss
   18. Percent combustion efficiency
   19. Heat output

E. Return Air/Outside Air:
   1. Identification/location
   2. Design air flow
   3. Actual air flow
   4. Design return air flow
   5. Actual return air flow
   6. Design outside air flow
   7. Actual outside air flow
   8. Return air temperature
   9. Outside air temperature
   10. Design outside/return air ratio
   11. Actual outside/return air ratio

F. Exhaust Fans:
   1. Location
   2. Manufacturer
   3. Model number
   4. Serial number
   5. Air flow, specified and actual
   6. Total static pressure (total external), specified and actual
   7. Inlet pressure
   8. Discharge pressure
   9. Sheave Make/Size/Bore
   10. Number of Belts/Make/Size
   11. Fan RPM

G. Sound Level Reports:
   1. Location

2. Octave bands - equipment off
3. Octave bands - equipment on

H. Vibration Tests:
1. Location of points:
   a. Fan bearing, drive end
   b. Fan bearing, opposite end
   c. Motor bearing, center (if applicable)
   d. Motor bearing, drive end
   e. Motor bearing, opposite end
2. Test readings:
   a. Horizontal, velocity and displacement
   b. Vertical, velocity and displacement

END OF SECTION

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SECTION 23 07 13
DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

C. Insulation jackets.

1.2 RELATED REQUIREMENTS

A. Section 099100 - Painting: Painting insulation jackets.

B. Section 230553 - Identification for HVAC Piping and Equipment.

C. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.3 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

D. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2011.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2010.

F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 1985 (Reapproved 2007).

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.

H. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2011.

I. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.

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J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.

L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2009.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

N. SMACNA (DCS) - HVAC Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 012500 - Submittal Procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Samples: Submit two samples of any representative size illustrating each insulation type.

D. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved. Include details for removable insulation sections at access panels.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:
1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. Substitutions: See Section 013300 - Substitution Procedures.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 1200 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gage.

2.3 GLASS FIBER, RIGID

A. Manufacturer:
1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. Substitutions: See Section 013300 - Substitution Procedures.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum service temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.

C. Aluminum Jacket: ASTM B209 (ASTM B209M).
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
   6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

D. Foil and Paper Jacket: ASTM C 921, Type 1. Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

E. Accessories:
   1. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..
   2. Bands: Aluminum 3/4 inch wide.
   3. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

4. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
5. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.5 DUCT LINER

A. Manufacturers:
1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
1. Fungi Resistance: ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
3. Service Temperature: Up to 250 degrees F.
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
5. Minimum Noise Reduction Coefficients:
a. 1/2 inch Thickness: 0.30.
b. 1 inch Thickness: 0.45.
c. 1-1/2 inches Thickness: 0.60.
d. 2 inch Thickness: 0.70.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

F. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

M. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

N. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

O. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

P. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

Q. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

R. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

END OF SECTION

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SECTION 23 07 16
HVAC EQUIPMENT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

1.2 RELATED REQUIREMENTS

A. Section 099100 - Painting: Painting insulation covering.

B. Section 230553 - Identification for HVAC Piping and Equipment.

1.3 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2010.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007.

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007.

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2011.

I. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2011.

J. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2012.

K. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2011.

L. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2012.

M. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2010.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

O. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.

P. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 012500 Submittal Procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturers:
1. Knauf Insulation; : www.knaufusa.com.
2. Johns Manville Corporation; : www.jm.com.
3. Owens Corning Corp; : www.owenscorning.com.
4. Substitutions: See Section 013300 - Substitution Procedures.

B. Insulation: ASTM C553; flexible, noncombustible.
1. 'K' Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
2. Secure with self-sealing longitudinal laps and butt strips.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

F. Insulating Cement/Mastic:
1. ASTM C195; hydraulic setting on mineral wool.

2.3 GLASS FIBER, RIGID

A. Manufacturer:
1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. Substitutions: See Section 013300 - Substitution Procedures.

B. Insulation: ASTM C612 or ASTM C 592; rigid, noncombustible.
1. 'K' Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.
4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with self-sealing longitudinal laps and butt strips.

D. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation.

E. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.

F. Insulating Cement/Mastic:
   1. ASTM C195; hydraulic setting on mineral wool.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell International: www.armacell.com.
   2. Substitutions: See Section 013300 - Substitution Procedures.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 3, in sheet form.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation

2.5 JACKETS

A. PVC Plastic:
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
   2. Jacket: Sheet material, off-white color.
      a. High-impact, ultraviolet-resistant PVC
      b. Minimum Service Temperature: -40 degrees F.
      c. Maximum Service Temperature: 150 degrees F.
      d. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
      e. Thickness: 10 mil.
      f. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic:
      a. Compatible with insulation.

B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

D. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
   1. Thickness: 0.010 inch.
   2. Finish: Smooth.

3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

E. Foil and Paper Jacket: ASTM C 921, Type 1. Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

F. Accessories:
1. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..
2. Bands: 3/4 inch wide, Aluminum.
3. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.
4. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

M. Fiber glass insulated equipment containing fluids below ambient temperature: Provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.

N. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and unions, but bevel and seal ends of insulation.

O. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

P. Fiber glass insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

Q. Inserts and Shields:
1. Application: Equipment 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between hangers and inserts.
3. Insert location: Between support shield and equipment and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

R. Finish insulation at supports, protrusions, and interruptions.

S. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.

T. Exterior Applications: Provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.

U. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement aluminum jacket.

V. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

W. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

END OF SECTION

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SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 RELATED REQUIREMENTS

A. Section 09 91 00 - Painting: Painting insulation jacket.

B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2010.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007.

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007.

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2011.

I. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2011.

J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2012.

K. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2012.

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L. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2011be1.

M. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 2010.

N. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2012a.

O. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 2011.

P. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008.

Q. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2007.

R. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

S. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

T. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.

U. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. Substitutions: See Section 01 33 00 - Substitution Procedures.

B. Insulation: ASTM C547 and ASTM C 795; rigid molded, noncombustible.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C 795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 650 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Vapor Barrier Lap Adhesive:

G. Insulating Cement/Mastic:
   1. ASTM C195; hydraulic setting on mineral wool.

H. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 5x5.

I. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.

2. Vinyl emulsion type acrylic, compatible with insulation, black color.

J. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Outdoor Breather Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

L. Insulating Cement:
1. ASTM C449/C449M.

2.3 CELLULAR GLASS

A. Insulation: ASTM C552, Grade 1.
1. 'K' value: 0.37 at 100 degrees F.
2. Service Temperature: Up to 900 degrees F.
3. Water Vapor Permeability: 0.005 perm inch.
4. Water Absorption: 0.2 percent by volume, maximum.

2.4 EXPANDED POLYSTYRENE

A. Insulation: ASTM C578; rigid closed cell.
1. 'K' value: 0.23 at 75 degrees F.
2. Maximum service temperature: 165 degrees F.
3. Maximum water vapor permeance: 5.0 perms

2.5 EXPANDED PERLITE

A. Insulation: ASTM C610, molded.
1. Maximum service temperature: 1200 degrees F.
2. Maximum water vapor transmission: 0.1 perm.

2.6 HYDROUS CALCIUM SILICATE

A. Insulation: ASTM C533 and ASTM C 795; rigid molded, asbestos free, gold color.
1. 'K' value: ASTM C177 and C518; 0.40 at 300 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum service temperature: 1200 degrees F.
3. Density: 15 lb/cu ft.

B. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

C. Insulating Cement:
1. ASTM C449/C449M.

2.7 POLYISOCYANURATE CELLULAR PLASTIC

A. Insulation Material: ASTM C591, rigid molded modified polyisocyanurate cellular plastic.
1. Dimension: Comply with requirements of ASTM C585.

2. 'K' value: 0.18 at 75 degrees F, when tested in accordance with ASTM C518.
3. Minimum Service Temperature: -70 degrees F.
4. Maximum Service Temperature: 300 degrees F.
5. Water Absorption: 0.5 percent by volume, maximum, when tested in accordance with ASTM D2842..
6. Moisture Vapor Transmission: 4.0 perm in.
7. Connection: Waterproof vapor barrier adhesive.

2.8 POLYETHYLENE

A. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
1. 'K' value: ASTM C177; 0.25 at 75 degrees F.
2. Maximum Service Temperature: 200 degrees F.
3. Density: 2 lb/cu ft.
4. Maximum Moisture Absorption: 1.0 percent by volume.
5. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
6. Connection: Contact adhesive.

2.9 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 3; use molded tubular material wherever possible.
1. Minimum Service Temperature: -40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.10 JACKETS

A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.
2. Covering Adhesive Mastic:
a. Compatible with insulation.

B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: -40 degrees F.
b. Maximum Service Temperature of 180 degrees F.

c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 30 mil.
e. Connections: Brush on welding adhesive.

C. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:

D. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

E. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
1. Thickness: 0.010 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

F. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

2.11 ACCESSORIES AND ATTACHMENTS:

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..

B. Bands: 3/4 inch wide aluminum.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

D. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

E. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

F. Apply insulation with the least number of joints practical.

G. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

H. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

I. Apply insulation with the least number of joints practical.

J. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

K. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

L. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

M. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

N. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

O. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

P. Exposed Piping: Locate insulation and cover seams in least visible locations.

Q. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

R. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive

adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

S. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

T. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

U. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

V. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

W. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

X. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.

Y. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

END OF SECTION

SECTION 23 09 13
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermostats.

B. Automatic dampers.

C. Damper operators.

1.2 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 33 00 - Air Duct Accessories: Installation of automatic dampers.

D. Section 23 09 23 - Direct-Digital Control System for HVAC.

E. Section 23 09 93 - Sequence of Operations for HVAC Controls.

F. Section 26 27 26 - Wiring Devices: Elevation of exposed components.

1.3 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods for Testing Dampers for Rating; Air Movement and Control Association International, Inc.; 2012.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2010).

C. ASTM B32 - Standard Specification for Solder Metal; 2008.

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.

E. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005 (Reapproved 2011).

F. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics; 2012.

G. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; National Electrical Manufacturers Association; 2008.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2012.

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Manufacturer's Instructions: Provide for all manufactured components.

D. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 78 23 - Operation and Maintenance Instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with documented experience approved by manufacturer.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.6 WARRANTY

A. See Section 01 77 00 - Closeout Procedures or 017836 - Warranties.

PART 2 - PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA 250, general purpose utility enclosures with enamelled finished face panel.

C. Provide common keying for all panels.

2.3 DAMPERS

A. Performance: Test in accordance with AMCA 500-D.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage.

C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, attached to minimum 1/2 inch shafts with set screws.

D. Blade Seals: Synthetic elastomeric inflatable mechanically attached, field replaceable.

E. Jamb Seals: Spring stainless steel.

F. Shaft Bearings: Oil impregnated sintered bronze.

G. Linkage Bearings: Oil impregnated sintered bronze.

H. Leakage: Less than one percent based on approach velocity of 2000 ft/min and 4 inches wg.

I. Maximum Pressure Differential: 6 inches wg.

J. Temperature Limits: -40 to 200 degrees F.

K. Product:
   1. Substitutions: See Section 01 33 00 - Substitution Procedures.

2.4 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
   1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
   2. Provide one operator for maximum 36 sq ft damper section.

B. Electric Operators:
   1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

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2. Product:
   a. Substitutions: See Section 01 33 00 - Substitution Procedures.

2.5 INPUT/OUTPUT SENSORS

A. Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 - 100 percent damper travel.

B. Carbon Dioxide Sensors:
   1. General: Provide wall mount non-dispersive infrared (NDIR) CO2 sensors with integral transducers and linear output.
      a. Linear, CO2 Concentration Range Display: 0 to 2000 ppm.
      b. Full Scale Accuracy: Plus/minus 100 ppm or plus/minus 5 percent of reading which ever is higher.
      c. Maximum Response Time: 1 minute.
      d. Analog Output: 0-10 VDC.
      e. Rated Ambient Conditions:
         1) Air Temperature: Range of 32 to 122 degrees F.
         2) Relative Humidity: Range of 0 to 95 percent (non-condensing).
      f. Calibration Characteristics:
         1) Automatically compensating algorithm for sensor drift due to sensor degradation.
         2) Maximum Drift: 2 percent.
         3) User calibratable with a minimum calibration interval of 5 years.
      g. Construction:
         1) Covers: clear cover, double wall construction, tamper-resistant lock and key, vented guard base.
         2) Manufacturer: Honeywell TG511A1000 or equal.

2.6 THERMOSTATS

A. Electric Room Thermostats:
   1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control and seven-day adjustable schedule.
   2. Service: cooling and heating.
   3. Covers: Locking with set point adjustment and setpoint indication, with thermometer.
   4. Product:
      a. Alerton VisualLogic Display (VLD)
      b. Substiutions: See Section 01 33 00 - Substitution Procedures.

B. Line Voltage Thermostats:
   1. Integral manual On/Off/Auto selector switch, single or two pole as required.
   2. Dead band: Maximum 2 degrees F.
   3. Cover: Locking with set point adjustment, with thermometer.
   4. Rating: Motor load.
   5. Product:
      a. Substitutions: See Section 01 60 00 - Product Requirements.

C. Room Thermostat Accessories:

1. Insulating Bases: For thermostats located on exterior walls.
2. Thermostat Guards: Locking transparent plastic mounted on separate base.
   a. Thermostat Covers: clear cover, double wall construction, tamper-resistant lock and key, vented guard base.
   b. Manufacturer: Honeywell TG511A1000 or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

C. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

D. Check and verify location of thermostats and CO2 sensors with plans and room details before installation. Locate 48 inches above floor, or at ADA acceptable height if different. Align with lighting switches . Refer to Section 26 27 26.

E. Provide guards on thermostats in where indicated and MPR buildings.

F. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for

instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

G. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

H. Provide conduit and electrical wiring in accordance with Section 26 27 26. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.
   1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.
   2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.
   3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
   4. Provide necessary mounting hardware and linkages for actuator installation.

3.4 MAINTENANCE

A. See Section 01 78 23 - Operation and Maintenance Instructions.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of control system for one year from Date of Substantial Completion.

D. Provide complete service of controls systems, including call backs, and submit written report of each service call.

END OF SECTION

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SECTION 23 09 93
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B. Section 23 09 23 - Direct-Digital Control System for HVAC.

C. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

1.2 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
3. Include at least the following sequences:
   a. Start-up.
   b. Warm-up mode.
   c. Normal operating mode.
   d. Unoccupied mode.
   e. Shutdown.
   f. Capacity control sequences and equipment staging.
   g. Temperature and pressure control, such as setbacks, setups, resets, etc.
   h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
   i. Effects of power or equipment failure with all standby component functions.
   j. Sequences for all alarms and emergency shut downs.
   k. Seasonal operational differences and recommendations.
   l. Interactions and interlocks with other systems.
4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

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6. Include schedules, if known.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
   1. Label with settings, adjustable range of control and limits.
   2. Include flow diagrams for each control system, graphically depicting control logic.
   3. Include the system and component layout on scaled plans of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
   4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
   5. Include all monitoring, control and virtual points specified elsewhere.
   6. Include a key to all abbreviations.

D. Points List: Submit list of all control points indicating at least the following for each point.
   1. Name of controlled system.
   2. Point abbreviation.
   3. Point description; such as dry bulb temperature, airflow, etc.
   4. Display unit.
   5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
   6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
   7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
   8. Calculated point (Yes / No); i.e. a "virtual" point generated from calculations of other point values.
   9. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.3 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed at the State in which the Project is located.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SEQUENCES

A. See drawings for detailed system level control sequences.

END OF SECTION

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SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Materials.

C. Casing and plenums.

D. Casings.

E. Duct cleaning.

F. Hangers and Supports

1.2 RELATED REQUIREMENTS

A. Section 09 91 00 - Painting: Weld priming, weather resistant, paint or coating.

B. Section 23 40 00 - HVAC Air Cleaning Devices: Cleaning ducts after completion of installation.

C. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

D. Section 23 33 00 - Air Duct Accessories.

E. Section 23 37 00 - Air Outlets and Inlets.

F. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2009.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications; 2012.

D. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes; 2010.

E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2012.

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F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2012

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength; 2012a

J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

K. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.

M. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

N. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

O. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2012.

P. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2012.

Q. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.

R. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.

S. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2011.

T. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.

U. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

V. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

W. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines; 2001.

X. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

Y. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

Z. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

AA. Duct system has been design for low friction drop, both through straight duct and through fittings. Fitting type may be substituted only for fittings of equal to or lesser pressure drop, with written permission from engineer.

BB. MSS SP-58, "Pipe Hangers and Supports - Materials, Design and Manufacture," latest edition. AC. MSS SP-69, "Pipe Hangers and Supports - Selection and Application," latest edition.

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedure.

B. Product Data: Provide data for duct materials.

C. Provide fabrication and installation details for metal ducts.
   1. Penetrations through fire-rated and other partitions.
   2. Duct accessories, including access doors and panels.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

E. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

F. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed specified requirements.

G. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.7 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

C. Ductwork shall be transported to the site in enclosed vehicles or with ends capped with Visqueen or foam caps.

D. Do not store ductwork directly on ground or floor.

E. Ductwork stored or stacked on site shall be capped.

F. Installed duct shall be capped at the end of the day. Duct found uncapped shall be cleaned.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
   1. Ducts shall have mill-phosphatized finish for surfaces exposed to view.
   2. Carbon steel, lock-forming quality, hot-dip galvanized, with spangle-type zinc coating, double seam without showing fracture. Conform to ASTM A525 and A527.

B. Flexible Ducts:
   1. UL Labeled, black polymer film supported by helically wound spring steel wire.
      a. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
      b. Maximum Velocity: 4000 fpm.
      c. Temperature Range: -20 degrees F to 175 degrees F.

C. Un-Galvanized Steel for Ducts: ASTM A 1008/A 1008M, Designation CS, cold-rolled commercial steel.

D. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

E. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 304.
   1. Machine made spiral lock-seam duct constructed of stainless steel with light reinforcing corrugations.

2. Fittings: Welded seam construction, manufactured of at least two gages heavier metal than duct. Flanged and gasketed connection to equipment or accessories.
3. Joints: Fully Welded in accordance with manufacturer's recommendation.

F. PVC Coating for Steel Ducts: 4 mils polyvinyl chloride plastic on both sides.

G. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. VOC Content: Not more than 250 g/L, excluding water.
3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
4. For Use With Flexible Ducts: UL labeled.
5. Products:
   a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant: www.carlislehvac.com.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

H. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

I. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Wedge Anchor Fastening System: Complying with ICC-ESR-2255.
2. Concrete Wedge Expansion Anchors: Complying with ICC-ES-AC193
3. Concrete Screw Type Anchors: Complying with ICC-ES-AC193
4. Concrete Adhesive Type Anchors: Complying with ICC-ES-AC308
5. Other Types: As required
6. Manufacturers:
   a. Epic Metals Corporation; Wedge Bolt System, 38WB250, ICC-ESR-2255.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

2.2 MANUFACTURED DUCTWORK AND FITTINGS

A. Flat Oval Ducts: Machine made from round spiral lockseam duct.
1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
2. Fittings: Manufacture at least two gages heavier metal than duct.
3. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Double Wall Insulated Flat Oval Ducts: Machine made from round spiral lockseam duct.
1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
2. Fittings: Manufacture with solid inner wall.
3. Inner wall: Perforated galvanized steel.

4. Insulation:
   a. Thickness: 1 inch fiberglass.

C. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: -10 degrees F to 160 degrees F.
5. Manufacturers:
   a. Hart & Cooley, Inc: www.hartandcooley.com.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

D. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.
1. UL labeled.
2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
3. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
4. Maximum Velocity: 4000 fpm.
5. Temperature Range: -20 degrees F to 175 degrees F.
6. Manufacturers:
   a. Hart & Cooley, Inc: www.hartandcooley.com.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

E. Flexible Ducts: Multiple layers of aluminum laminate supported by helically wound spring steel wire.
1. UL labeled.
2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
3. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
4. Maximum Velocity: 4000 fpm.
5. Temperature Range: -20 degrees F to 210 degrees F.
6. Manufacturers:
   a. Hart & Cooley, Inc: www.hartandcooley.com.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

F. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: -20 degrees F to 210 degrees F.
5. Manufacturers:
   a. Hart & Cooley, Inc: www.hartandcooley.com.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

G. Flexible Ducts: UL 181, Class 0, interlocking spiral of aluminum foil.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 8 inches WG positive or negative.
3. Maximum Velocity: 5000 fpm.
4. Temperature Range: -20 degrees F to 250 degrees F.
5. Manufacturers:
   a. Hart & Cooley, Inc: www.hartandcooley.com.
   b. Substitutions: See Section 01 33 00 - Substitution Procedure.

H. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
   1. Manufacturers:
      a. Elgen Manufacturing; : www.elgenmfg.com.
      b. Carlisle HVAC Products; Nexus Flange Connectors with Sealant Pocket: www.carlislehvac.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 CASINGS AND PLENUMS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
   1. Provide clear wire glass observation ports, minimum 6 X 6 inch size.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

2.4 HANGERS AND SUPPORTS

A. Verify all duct and hanger attachments with structural engineer.

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
   1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
   2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Materials: Galvanized sheet steel or threaded steel rod.

D. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

E. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports: Galvanized-steel shapes and plates complying with ASTM A 36/A 36M.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.

B. Install in accordance with manufacturer's instructions.

C. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

D. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.

E. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

F. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

G. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

H. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

I. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

J. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

K. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

L. Cross Break all metal ductwork to ensure rigidity.

M. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

N. Flexible Ducts: Connect to metal ducts with adhesive.

O. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.

P. PVC Coated Metal Ductwork: Tape with PVC tape.

Q. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

R. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

S. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

T. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

U. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

V. Install ducts with fewest possible joints.

W. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

X. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

Y. Use double nuts and lock washers on threaded rod supports.

Z. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

AA. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."

BB. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

CC. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

DD. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of

same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

EE. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

FF. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

GG. Protect ductwork during construction against entry of foreign matter and construction dirt.

HH. Keep ductwork capped when work is complete for the day or when the certain main or trunk line is not being worked on or added to. The use of polyvinyl with ductape wrap is an adequate measure as long as it is secure with no openings or tears in the product.

II. At exterior wall louvers, seal duct to louver frame and install blank-out panels

JJ. Seal ducts before external insulation is applied.

KK. Stainless steel exhaust ductwork: Joints to be continuously welded.

LL. All ductwork located outdoors shall be designed to be waterproof and sloped for water run-off.

3.2 HANGERS AND SUPPORTS

A. Materials, design and manufacture of all supports, anchors and sleeves to comply with MSS SP-58, "Pipe Hangers and Supports - Materials, Design and Manufacture," latest edition.

B. Select and apply pipe hangers and supports complying with MSS SP-69, "Pipe Hangers and Supports - Selection and Application," latest edition. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for un-insulated copper piping systems.
   1. Pipe Hangers Size 2 Inches and Smaller: Adjustable swivel ring hanger, UL listed
   2. Pipe Hangers Size 2-1/2 Inches and Larger: Adjustable clevis type, UL listed

C. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Support vertical ducts at maximum intervals of 16 feet and at each floor.

E. Vertical runs of pipe shall be supported with steel, UL listed riser clamps made specifically for pipe or for tubing.

F. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

G. Install concrete inserts before placing concrete.

H. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

I. The use of pipe hooks, chains, plumbers tape, or perforated iron for pipe supports is not acceptable.

J. All piping supports that are in contact with the outdoor air shall be protected against corrosion.

3.3 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. Remove dirt and foreign matter from entire duct system and clean diffusers, registers and grilles before operating fans.

3.4 DUCT AIR LEAKAGE TEST

A. Laboratory duct air leakage testing
   1. Connect a blower to the duct specimen through a shutoff valve. Provide a magnehelic gauge or inclined manometer with 0 to 10 inch W.G. range on the duct side of the shutoff valve.
   2. Provide temporary seals at all open ends of the duct.
   3. Average test pressure shall be 6 inches W.G. Initial pressure shall be 7 inches W.G.
   4. All fume duct joints from the fume hood collar to the fan inlet flex connection, notinclusive, shall be tested.
   5. To prevent over-pressurizing the ducts, start the blower with the variable inlet damper closed. Controlling pressure carefully, pressurize the duct section to the required level.
   6. When the pressure of the duct reaches 7 inches W.G., close the shutoff valve.
   7. Using a stopwatch, measure the time elapsed from when the duct is at 7 inches W.G. to 5 inches W.G. Use the formula t=6.23D to determine if the duct passes the test. ("D" is the nominal duct diameter, measured in inches; "t" is the MINIMUM allowable elapsed time, measured in seconds.)

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8. If the test fails to meet the allowable rate, make necessary repairs and retest until satisfactory results are obtained. Contact the Owner's Representative to witness the test.
9. Complete test reports.
10. Comply with precautions listed in the current SMACNA HVAC Air Duct Leakage Test Manual.

B. Risers and all supply and exhaust branch ducting shall be tested to within 5 feet of a diffuser collar or the point of connection to an exhaust device, respectively. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.
4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

END OF SECTION

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Air extractors.

B. Backdraft dampers - metal.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connections.

H. Smoke dampers.

I. Volume control dampers.

J. Turning vanes.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

C. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

D. Section 23 31 00 - HVAC Ducts and Casings.

E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.

B. NFPA 92 - Standard for Smoke-Control Systems; 2012.

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C. NFPA 96 - Standard Ventilation Control and Fire Protection of Commercial Cooking Cooking Operations; 2011.

D. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

E. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

F. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

G. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Fusible Links: One of each type and size.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.1 AIR EXTRACTORS

A. General: Air extractors shall not be used under any circumstances, except with the expressed written consent of the owner's engineer.

2.2 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Turning vanes are required in all 90 degree duct elbows, unless noted otherwise.

C. Fabricate double-vane, curved blades of galvanized sheet steel at a radius of 2.0", and at a distance of 1 1/2" between vanes; support with bars perpendicular to blades, one between each blade; and set into vane runners suitable for duct mounting.
   1. Available Manufacturers:
      a. Ductmate Industries, Inc.
      b. Duro Dyne Corp.
      c. METALAIRE, Inc.
      d. Ward Industries, Inc.
      e. Or equal.

D. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

E. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.3 BACKDRAFT DAMPERS

A. Fabric Backdraft Dampers: Factory-fabricated, 18 gage, galvanized steel frame.

B. Blades: Neoprene coated fabric material.

C. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.

D. Maximum Velocity: 1000 fpm (5 m/sec) face velocity.

2.4 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:

B. Louvers & Dampers, Inc: www.louvers-dampers.com.

C. Nailor Industries Inc: www.nailor.com.

D. Ruskin Company: www.ruskin.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

G. Provide factory sleeve and collar for each damper.

H. Multiple Blade Dampers: Fabricate with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

I. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.5 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Fabricate doors airtight and suitable for duct pressure class.

C. Access doors with sheet metal screw fasteners are not acceptable.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

2.6 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.7 FIRE DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com.
   2. Nailor Industries Inc: www.nailor.com.
   3. Ruskin Company: www.ruskin.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream.

F. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.8 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Noninsulated-Duct Connectors: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire.

C. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.

D. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

E. Flexible Duct Connections: Fabric crimped into metal edging strip.

F. Maximum Installed Length: 60 inch.

2.9 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc: www.louvers-dampers.com.
2. Nailor Industries Inc: www.nailor.com.
3. Ruskin Company: www.ruskin.com.
4. Substitutions: See Section 01 33 00 - Substitution Procedure.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

C. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

D. Standard Volume Dampers: Multiple- or single-blade, parallel-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

E. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

G. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
1. Fabricate for duct sizes up to 6 x 30 inch.
2. Blade: 24 gage, minimum.

H. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
1. Blade: 18 gage, minimum.

I. Multi-Blade Damper: Fabricate of parallel blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

J. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

K. Quadrants:
1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, turning vanes and elsewhere as indicated. Provide duct access doors tProvide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

E. Provide duct test holes where indicated and required for testing and balancing purposes.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

H. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

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SECTION 23 34 00
HVAC AIR CLEANING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Disposable panel filters.

B. Filter frames.

C. Washable permanent panel filters.

1.2 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls: Filters for temporary heating and ventilating.

B. Section 26 27 26 - Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 850 - Performance Rating of Commercial and Industrial Air Filter Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2004.

B. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

D. MIL-STD-282 - Filter Units, Protective Clothing, Gas-Mask Components, and Related Products: Performance-Test Methods; Military Specifications and Standards; 1956; Revision 4, 1995.

E. UL 586 - High Efficiency, Particulate, Air Filter Units; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

F. UL 867 - Electrostatic Air Cleaners; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

G. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

A. Conform to AHRI 850 Section 7.4.

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1.5 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

D. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

F. See Section 01 77 00 - Closeout Procedures.

G. Extra Filters: One set of each type and size.

1.6 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PART 2 PRODUCTS

2.1 FILTER MANUFACTURERS

A. American Filtration Inc: www.americanfiltration.com.

B. AAF International/American Air Filter: www.aafintl.com.

C. Camfil Farr Company: www.camfilfarr.com.

2.2 DISPOSABLE PANEL FILTERS

A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
   1. Thickness: 1 inch.

B. Performance Rating:
   1. Face Velocity: 500 FPM.
   2. Initial Resistance: 0.15 inch WG.
   3. Recommended Final Resistance: 0.50 inches WG.

2.3 WASHABLE PERMANENT PANEL FILTERS

A. Media: 14 mesh steel screen, zinc electroplated, alternate layers of flat and herringbone crimp, four layers per inch; rod reinforced.

B. Performance Rating:

C. Initial Resistance at 500 FPM face velocity: 0.10 inch WG.

D. Recommended Final Resistance at 500 FPM face velocity: 0.50 inch WG.

2.4 FILTER FRAMES AND HOUSINGS

A. General: Fabricate filter frames and supporting structures of 16 gage galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.

B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 x 24 inches filter media, minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 34 16
CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Backward inclined centrifugal fans.

B. Forward curved centrifugal fans.

C. Inline centrifugal fans.

D. Motors and drives.

E. Fan accessories.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 07 13 - Duct Insulation.

D. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

E. Section 26 27 17 - Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).

C. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2010.

D. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

E. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/certified/search/company.aspx.

F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.

G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 1990.

H. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

I. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.4 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
   1. Motors shall be NEMA premium efficiency at a minimum.

D. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

E. Fabrication: Conform to AMCA 99.

F. Performance Base: Sea level conditions.

G. Temperature Limit: Maximum 300 degrees F.

H. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

1.5 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
   1. Fan operating efficiency.
   2. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   3. Material gages and finishes, including color charts.
   4. Dampers, including housings, linkages, and operators

C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for

both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1. Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   a. Wiring Diagrams: Power, signal, and control wiring.
   b. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

D. Manufacturer's Instructions: Include complete installation instructions.

E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 77 00 - Closeout Procedures.
   2. Extra Fan Belts: One set for each individual fan.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.8 FIELD CONDITIONS

A. Permanent fans may not be used for ventilation during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Greenheck

B. Panasonic

C. Broan

D. Substitutions: See Section 01 33 00 Substitution Procedures.

2.2 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

B. Forward Curved: Black enamelled steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.

C. Coatings: Hot-dip galvanized.

2.3 HOUSING

A. Heavy gage steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut

B. Factory finish before assembly to manufacturer's standard. For fans handling air downstream of humidifiers, provide two additional coats of paint. Prime coating on aluminum parts is not required.

C. Provide bolted construction with horizontal flanged split housing, where indicated.

D. Fabricate plug fans without volute housing, in lined steel cabinet. Refer to Section 23 07 13.

E. Materials and Fabrication: Formed and reinforced steel panels to make curved scroll housings with shaped cutoff, spun-metal inlet bell, and doors or panels to allow access to internal parts and components. Use galvanized steel to fabricate fans downstream from humidifiers.
   1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
   2. Fabrication Class: AMCA 99, Class I.
   3. Horizontal Flanged Split Housing: Bolted construction.
   4. Plug Fans: Fabricate without fan scroll and volute housing, with steel cabinet.
   5. Tubular Centrifugal Fans: Fabricate tubular housing from formed and reinforced steel panels with welded seams and the following:
      a. Outlet guide vanes.
      b. Motor and disconnect switch.
      c. Spun inlet cone with flange.
      d. Outlet flange.
      e. Brackets suitable for horizontal or vertical mounting.

2.4 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA 9 life at 50,000 hours.

B. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

C. Shafts statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

D. Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under, selected so required rpm is obtained with sheaves set at mid Fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

E. Fan Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.

F. 5-hp limit is standard with many manufacturers but is a designer's choice.

G. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

H. Belt Guard: Fabricate to SMACNA Duct Construction Standards; 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

I. Motor Mount: Adjustable for belt tensioning.

2.5 ACCESSORIES

A. Discharge Dampers: Parallel blade heavy duty steel damper assembly with blades constructed of two plates formed around and welded to shaft, channel frame, sealed ball bearings, with blades linked out of air stream to single control lever.

B. Access Doors: Shaped to conform to scroll, with quick opening latches and gaskets.

C. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads. Refer to Section 23 05 48.

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C. Install flexible connections between fan inlet and discharge ductwork; refer to Section 23 33 00. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

D. Install fan restraining snubbers; refer to Section 23 05 48. Adjust snubbers to prevent tension in flexible connectors when fan is operating.

E. Provide fixed sheaves required for final air balance.

F. Provide safety screen where inlet or outlet is exposed.

G. Provide backdraft dampers on discharge of exhaust fans and as indicated; refer to Section 23 33 00.

H. Install units with clearances for service and maintenance.

END OF SECTION

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SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers.

1.2 RELATED REQUIREMENTS

A. Section 09 91 00 - Painting: Painting of ducts visible behind outlets and inlets.

1.3 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2012.

B. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.

C. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Product Data: Provide data for equipment required for this project, including materials of construction, finish, accessories furnished and mounting details. Provide performance data including throw and drop, static-pressure drop, and noise ratings. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.5 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carnes Company HVAC: www.carnes.com.

B. Krueger: www.krueger-hvac.com.

C. Titus: www.titus-hvac.com.

D. Ruskin: www.ruskin.com.

E. Substitutions: See Section 01 33 00 - Substitution Procedures.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, stamped, multi-core, square, adjustable pattern, stamped, multi-core, square and rectangular, multi-louvered, square and rectangular, adjustable pattern, and multi-louvered diffuser to discharge air in 360 degree, one way, two way, three way, and four way pattern with sectorizing baffles where indicated.

B. Connections: Round.

C. Frame: Provide surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Steel with baked enamel finish.

E. Color: As selected by Architect from manufacturer's standard range.

F. Accessories: Provide radial opposed blade volume control damper; removable core with damper adjustable from diffuser face.

G. Material: Steel, unless otherwise noted.

H. Finish: Baked enamel, white.

I. Face Size: See Drawings.

J. Face Style: See Schedule.

K. Mounting: Surface.

L. Pattern: Fixed.

2.3 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory enamel finish.

D. Color: As selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

F. Material: Steel, unless otherwise noted.

G. Finish: Baked enamel, white.

H. Mounting: Countersunk screw

2.4 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish, unless otherwise noted.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.5 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

F. Finish: Mill finish.

G. Face Blade Arrangement: Fixed horizontal spaced 3 inches apart.

H. Rear Blade Arrangement: Fixed horizontal spaced 3/4 inch apart.

I. Frame: 1 1/4 inches wide.

J. Mounting: Countersunk screw.

K. Accessories: Front-blade gang operator

2.6 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

E. Finish: Mill finish.

F. Face Blade Arrangement: Fixed horizontal spaced 3 inches apart.

G. Rear Blade Arrangement: Fixed horizontal spaced 3/4 inch apart.

H. Frame: 1 1/4 inches wide.

I. Mounting: Countersunk screw.

2.7 LOUVERS

A. Type: 1.5 or 6 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.

B. Color: To be selected by Architect from manufacturer's standard range.

C. Refer to mechanical schedule for louver requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

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E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 91 00.

F. Install diffusers, registers, and grilles level and plumb.

G. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

H. Install diffusers, registers, and grilles to ducts to allow service and maintenance of dampers, air extractors, and fire dampers.

I. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

J. Install intake and relief ventilators level, plumb, and at indicated alignment with adjacent work.

K. Secure intake and relief ventilators to roof curbs with cadmium-plated hardware. Use concealed anchorages where possible.

L. Install intake and relief ventilators with clearances for service and maintenance.

M. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

N. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation.

O. Label intake and relief ventilators according to requirements specified in Division 23 Section "Mechanical Identification."

P. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

Q. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

R. Adjust damper linkages for proper damper operation.

END OF SECTION

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SECTION 23 54 00
FURNACES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Forced air furnaces.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment: Additional requirements for fan motors.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 07 13 - Duct Insulation: Duct Liner.

D. Section 22 10 05 - Plumbing Piping: Natural gas piping.

E. Section 23 51 00 - Breechings, Chimneys, and Stacks: Flue or stack.

F. Section 23 31 00 - HVAC Ducts and Casings.

G. Section 23 09 13 - Instrumentation and Control Devices for HVAC: Thermostats, humidistats, time clocks.

H. Section 26 27 26 - Wiring Devices: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.3 REFERENCE STANDARDS

A. AHRI 610 - Performance Rating of Central System Humidifiers for Residential Applications; Air Conditioning, Heating, and Refrigeration Institute; 2004.

B. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

D. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings, Refrigerating and Air-Conditioning Engineers, Inc.; 2010, Including All Addenda (ANSI/ASHRAE/IESNA Std 90.1).

E. ASHRAE Std 90.2 - Energy-Efficient Design of New Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

F. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

G. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

H. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2011.

I. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.

K. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.

L. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2010.

1.4 SUBMITTALS

A. See Section 01 25 00 - Submittal Procedures.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 77 00 - Closeout Procedures.
   2. Extra Filters: One for each furnace.

1.5 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 WARRANTY

A. See Section 01 78 36 - Warranties, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carrier Corporation: www.carrier.com.

B. Substitutions: See Section 01 33 00 - Substitution Procedures.

2.2 GAS FIRED FURNACES

A. Annual Fuel Utilization Efficiency (AFUE): 0.95 ("condensing").

B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.
   1. Safety certified by CSA in accordance with ANSI Z 21.47.
   2. Venting System: Direct.
   3. Combustion: Sealed
   4. Air Flow Configuration: Upflow.
   5. Heating: Natural gas fired.
   6. Accessories:
      a. Concentric wall termination kit.
      b. ECM motor kit.
      c. Filter pack.
      d. Media filter cabinet.

C. Performance:
   1. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner. If not certified for combustible flooring, please provide additional steel base.

E. Primary Heat Exchanger:
   1. Material: Hot-rolled steel
   2. Shape: Tubular type.

F. Secondary Heat Exchanger:
   1. Material: Aluminized steel.

G. Gas Burner:
   1. Atmospheric type with adjustable combustion air supply,
   2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.
   4. Combustion air damper with synchronous spring return damper motor.
   5. Non-corrosive combustion air blower with permanently lubricated motor.

H. Gas Burner Safety Controls:

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1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
2. Flame rollout switch: Installed on burner box and prevents operation.
3. Vent safety shutoff sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

I. Supply Fan: Centrifugal type rubber mounted with direct drive with adjustable variable pitch motor pulley.

J. Motor: Refer to Section 22 05 13; 1750 rpm single speed, permanently lubricated, hinge mounted.

K. Air Filters: 1 inch thick urethane, washable type arranged for easy replacement.

L. Operating Controls
1. Room Thermostat: Cycles burner to maintain room temperature setting.
2. Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation. Refer to controls specification Section 23 09 23.

2.3 ECONOMIZER DAMPER UNITS

A. Manufacturers:
1. MicroMetl.

B. Cabinet: Steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation.

C. Dampers: Formed steel with nylon bearings and gaskets.

D. Dampers Operator: 24 volt, three position spring return motor with adjustable minimum position switch.

E. Controls: Refer to controls drawing and specification Sections 230923 and 230913.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and located correctly.

C. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.

B. Install in accordance with NFPA 90A.

C. Install gas fired furnaces in accordance with NFPA 54.

D. Provide vent connections in accordance with NFPA 211.

END OF SECTION

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SECTION 238239.19
WALL AND CEILING UNIT HEATERS

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 wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, and details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include details of anchorages and attachments to structure and to supported equipment.
   4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
   5. Wiring Diagrams: Power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dayton

B. Runtal

C. Berko

D. INDEECO

E. Marley Engineered

2.2 DESCRIPTION

A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 CABINET

A. Front Panel: Stamped-steel louver with removable panels fastened with tamperproof fasteners.

B. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls and visible alarm for high-temperature protection

2.5 FAN AND MOTOR

A. Fan: Aluminum propeller directly connected to motor.

B. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6 CONTROLS

A. Controls: Unit-mounted thermostat.

B. Electrical Connection: Factory wire motors and controls for a single field connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive wall and ceiling unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall and ceiling unit heaters to comply with NFPA 90A.

B. Install wall and ceiling unit heaters level and plumb.

C. Ground equipment according to Division 26.

D. Connect wiring according to Division 26.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
   1. Section 27 15 00 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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. Belden Inc.

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2. Encore Wire Corporation.
3. General Cable Technologies Corporation.
4. General Cable; General Cable Corporation.
5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2 Type XHHW-2 Type UF Type USE and Type SO.

2.2 CONNECTORS AND SPLICES

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. 3M.
2. AFC Cable Systems, Inc.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. ILSCO.
6. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
7. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, 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.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. XHHW insulation for feeders, THHN/THWN-2 for branch circuits

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

H. Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

J. #8 and larger, stranded

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. 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.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

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3.4 CONNECTIONS

A. Tighten electrical 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-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 00 " Firestopping."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
      a. Feeders to generator and automatic transfer switches.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
      a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.

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b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test and Inspection Reports: Prepare a written report to record the following:
1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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 grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Ground bonding common with lightning protection system.
   3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Test wells.
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
      a. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems based on NETA MTS
         1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

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2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. ILSCO.
4. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, 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 UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
1. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformer: Comply with utility company's grounding standards.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

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F. Metallic Fences: Comply with requirements of IEEE C2.
   1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
   2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
   3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least three rods spaced at least two-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.
   1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a

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lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Installbonding jumper to bond across flexible duct connections to achieve continuity.

H. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without 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.
   b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each test well, ground rod and 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.

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C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.

3.8 Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance

END OF SECTION

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SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

B. Related Requirements:
   1. Section 26 05 48.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 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. Structural members to which hangers and supports will be attached.
   3. Items penetrating finished ceiling, including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Projectors.

B. Seismic Qualification 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.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design hanger and support system.

B. 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 system will be fully operational after the seismic event."
   2. Component Importance Factor: 1.5.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
   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.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. Unistrut; an Atkore International company.
   2. Material: Galvanized steel.
   3. Channel Width: 1-5/8 inches.
   4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   5. Channel Dimensions: Selected for applicable load criteria.

B. 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.

C. 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.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. 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.

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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.

2. 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.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: Stainless-steel springhead type.
6. 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 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as 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.

D. 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 50 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

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, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.

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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. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
   6. To Light Steel: Sheet metal screws.
   7. 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 50 00 "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 33 00 "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.

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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. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Surface raceways.
   5. Boxes, enclosures, and cabinets.
   6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
   1. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

C. Samples: For wireways and surface raceways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.

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2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal 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.
   4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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. AFC Cable Systems, Inc.
   2. Allied Tube & Conduit.
   3. FSR Inc.
   4. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
   5. Robroy Industries.
   6. Thomas & Betts Corporation, A Member of the ABB Group.
   7. Western Tube and Conduit Corporation.
   8. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

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H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: Setscrew or compression.
   3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
   4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

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. AFC Cable Systems, Inc.
   2. Arnco Corporation.
   3. CANTEX INC.
   4. Electri-Flex Company.
   5. RACO; Hubbell.
   6. Thomas & Betts Corporation, A Member of the ABB Group.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Rigid HDPE: Comply with UL 651A.

G. Continuous HDPE: Comply with UL 651B.

H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

I. RTRC: Comply with UL 1684A and NEMA TC 14.

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J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Comply with UL 514B.

L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper B-Line, Inc.; a division of Cooper Industries.
   2. Hoffman; a brand of Pentair Equipment Protection.
   3. MonoSystems, Inc.
   4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Wiremold 4000 series.

C. Surface Aluminum Raceways: Alloy 6063-T5 extruded aluminum, minimum thickness 0.050 inches. Satin, No. 204 clear anodized, 0.004 inch thick, Class

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R1 Mil-Spec finish. Device cover plates suitable to mount commercially available duplex devices, single 1.40 inch and 1.59 inch diameter receptacles, GFCI, surge receptacles and other rectangular faced devices, and voice and data jacks. Devices shall be mounted to cover plates held in place by extruded protrusions. Cover plates shall be removable using standard screwdriver without marring the finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Wiremold AL4000 series
   b. Hubbel 4750 series

2.5 BOXES, ENCLOSURES, AND CABINETS

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. Adalet.
   2. Cooper Technologies Company.
   3. EGS/Appleton Electric.
   4. Erickson Electrical Equipment Company.
   5. FSR Inc.
   6. Hoffman; a brand of Pentair Equipment Protection.
   7. Hubbell Incorporated.
   8. MonoSystems, Inc.
   9. Oldcastle Enclosure Solutions.
   10. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
   11. RACO; Hubbell.
   12. Robroy Industries.
   13. Spring City Electrical Manufacturing Company.
   14. Thomas & Betts Corporation, A Member of the ABB Group.
   15. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

L. Gangable boxes are prohibited.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 4, Type 12 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:
1. NEMA 250, Type 1, Type 3R, Type 4, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
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. Armorcast Products Company.
b. Carson Industries LLC.
c. Oldcastle Precast, Inc.

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2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
2. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC IMC EMT.
3. Underground Branch Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Underground Feeder Conduit: Type EPC-40-PVC, concrete encased.
5.
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
7. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Gymnasiums.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

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5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. 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.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inchesof enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. 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. Secure raceways to reinforcement at maximum 10-footintervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
   5. Change from RNC, Type EPC-40-PVC, to GRC, IMC or EMT before rising above floor.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

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Q. 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. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:
1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   b. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   c. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Branch Circuit Conduit (600 V and less):
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 14 00 "Earth Stripping and Stockpiling" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 31 14 00 "Earth Stripping and Stockpiling".
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling

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with normal compaction as specified in Section 31 14 00 "Earth Stripping and Stockpiling".

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 00 "Firestopping."

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3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

3.8 Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

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SECTION 26 05 43
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

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. Direct-buried conduit, ducts, and duct accessories.
   2. Concrete-encased conduit, ducts, and duct accessories.
   3. Handholes and boxes.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include duct-bank materials, including separators and miscellaneous components.
   2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
   3. Include accessories for handholes, boxes, and other utility structures.
   4. Include warning tape.

B. Shop Drawings:
   1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:
      a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
      b. Include duct entry provisions, including locations and duct sizes.
      c. Include cover design.
      d. Include grounding details.
      e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.
   1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
   2. Drawings shall be signed and sealed by a qualified professional engineer.

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B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

1.6 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
   1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without Owner's written permission.

B. Ground Water: Assume ground-water level is 36 inches below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

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. ARNCO Corp.
   2. CANTEX INC.
   3. Condux International, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Duct Accessories:
   1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
   2. Warning Tape: Underground-line warning tape specified in Section 26 05 53 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Christy Concrete Products.
   2. Oldcastle Precast, Inc.
   3. Utility Concrete Products, LLC.
   4. Utility Vault Co.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
   1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
   2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   3. Cover Legend: Molded lettering, As indicated for each service.
   4. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
   5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
      a. Extension shall provide increased depth of 12 inches.
      b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.
   6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
   7. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches vertically and horizontally to accommodate alignment variations.
      a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
      b. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
      c. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

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8. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.
   1. Tests of materials shall be performed by an independent testing agency.
   2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
   3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 31 11 00 "Clearing and Grubbing". Remove and stockpile topsoil for reapplication according to Section 31 11 00 "Clearing and Grubbing".

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

D. Underground Ducts Crossing Paved Paths Walks and Driveways Roadways and Railroads: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:
   1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.

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2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 31 14 00 "Earth Stripping and Stockpiling," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Cut and patch existing pavement in the path of underground ducts and utility structures according to 02 40 00 "Site Demolition".

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 12.5 feet, both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Duct Entrances to Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

F. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

G. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

H. Pulling Cord: Install 100-lbf- test nylon cord in empty ducts.

I. Direct-Buried Duct Banks:
   1. Excavate trench bottom to provide firm and uniform support for duct bank.
   2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
   3. Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
   4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
   5. Set elevation of bottom of duct bank below frost line.
   6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
   7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
      b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
   9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 14 00 "Earth Stripping and Stockpiling" for installation of backfill materials.

a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.

J. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF CONCRETE HANDHOLES, AND BOXES

A. Precast Concrete Handhole Installation:
1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:
1. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
2. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Field-Installed Bolting Anchors in Concrete Handholes: Do not drill deeper than 2 inches for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space

for future cables, but short enough to preserve adequate working clearances in enclosure.

E. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:
   1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
   2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
   3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION

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SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:
1. Section 07 84 00 "Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
1. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

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1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:
   a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
   b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   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. Advance Products & Systems, Inc.
      b. Pipeline Seal and Insulator, Inc.
   2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Carbon steel.
   4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.
   5. 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. HOLDRITE.

2.3 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
   2. Sealant shall not exceed VOC content (in g/L) according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the

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Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

3.3 Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION

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SECTION 26 05 48.16
SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

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. Restraint channel bracings.
   2. Restraint cables.
   3. Seismic-restraint accessories.
   4. Mechanical anchor bolts.
   5. Adhesive anchor bolts.

B. Related Requirements:
   1. Section 26 05 29 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
      b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.
   1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic and wind forces required to select seismic and wind restraints and for designing vibration isolation bases.
      a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
   3. Seismic- and Wind-Restraint Details:
      a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.

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b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.

d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

B. Qualification Data: For professional engineer and testing agency.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:
1. Basic Wind Speed: See Architectural drawings and specifications.

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2. Building Classification Category: See Architectural drawings and specifications.
3. Minimum 10 lb/sq. ft. (48.8 kg/sq. m) multiplied by maximum area of HVAC component projected on vertical plane normal to wind direction and 45 degrees either side of normal.

B. Seismic-Restraint Loading:
1. Site Class as Defined in the CBC: See Architectural / Structural drawings and specifications.
2. Assigned Seismic Use Group or Building Category as Defined in the CBC: See Architectural / Structural drawings and specifications for the following:
   a. Component Importance Factor
   b. Component Response Modification Factor
   c. Component Amplification Factor
3. Design Spectral Response Acceleration at Short Periods (0.2 Second): See Structural drawings and specifications.
4. Design Spectral Response Acceleration at 1.0-Second Period: See Structural drawings and specifications.

2.2 RESTRAINT CHANNEL BRACINGS

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. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; an Atkore International company.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.3 RESTRAINT CABLES

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. Kinetics Noise Control, Inc.
2. Vibration Mountings & Controls, Inc.

B. Restraint Cables: ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

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. Cooper B-Line, Inc.; a division of Cooper Industries.
   2. Kinetics Noise Control, Inc.
   3. Mason Industries, Inc.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings and restraint cables.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

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. Cooper B-Line, Inc.; a division of Cooper Industries.
   2. Hilti, Inc.
   3. Kinetics Noise Control, Inc.
   4. Mason Industries, Inc.

B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 33 00 "Cast-in-Place Concrete."

B. Equipment and Hanger Restraints:
   1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:
1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

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. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels, including arc-flash warning labels.
8. Miscellaneous identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Raceways and Cables Carrying Circuits at More Than 600 V:
1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

C. Warning labels and signs shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 LABELS

A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
   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. Brady Corporation.
      b. Panduit Corp.
      c. Seton Identification Products.

B. Snap-Around Labels for Raceways and Cables Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceways they identify, and that stay in place by gripping action.
   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. Brady Corporation.
      b. Panduit Corp.
      c. Seton Identification Products.

C. Self-Adhesive Labels:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady Corporation.
      b. Ideal Industries, Inc.
      c. Panduit Corp.
      d. Seton Identification Products.
   2. Vinyl, thermal, transfer-printed, 3-mil- thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
      a. Nominal Size: 3.5-by-5-inch.
   3. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES:

A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.

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. Brady Corporation.
   b. Marking Services, Inc.
   c. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.
   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. Brady Corporation.
      b. Panduit Corp.

2.5 TAPES AND STENCILS:

A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
   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. Brady Corporation.
      b. Carlton Industries, LP.
      c. Marking Services, Inc.

B. Tape and Stencil for Raceways Carrying Circuits 600 V or Less: 4-inch- wide black stripes on 10-inch centers placed diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
   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. LEM Products Inc.
      b. Marking Services, Inc.
      c. Seton Identification Products.

C. Floor Marking Tape: 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
   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. Carlton Industries, LP.
      b. Seton Identification Products.

D. Underground-Line Warning Tape
   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. Brady Corporation.
b. Ideal Industries, Inc.
c. Marking Services, Inc.
d. Seton Identification Products.

2. Tape:
   a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   b. Printing on tape shall be permanent and shall not be damaged by burial operations.
   c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
   a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
   b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
   c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
4. Tag: :
   a. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
   b. Width: 3 inches.
   c. Overall Thickness: 8 mils.
   d. Foil Core Thickness: 0.35 mil.
   e. Weight: 34 lb/1000 sq. ft..
   f. Tensile according to ASTM D 882: 300 lbf and 12,500 psi.

E. Stenciled Legend: In nonfading, waterproof, ink or paint. Minimum letter height shall be 1 inch.

2.6 Tags

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
   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. Brady Corporation.
      b. Marking Services, Inc.
      c. Seton Identification Products.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

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. Brady Corporation.
   b. Marking Services, Inc.
   c. Panduit Corp.
   d. Seton Identification Products.

C. Write-On Tags:
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. Carlton Industries, LP.
   b. Seton Identification Products.
2. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 Signs

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlton Industries, LP.
   b. Marking Services, Inc.

B. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
2. Thickness:
   a. For signs up to 20 sq. inches, minimum 1/16-inch-.
   b. For signs larger than 20 sq. inches, 1/8 inch thick.
   c. Engraved legend with black letters on white face.
   d. Punched or drilled for mechanical fasteners.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
3. 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. Brady Corporation.
   b. Carlton Industries, LP.
   c. emedco.
   d. Marking Services, Inc.

2.8 CABLE TIES

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. Ideal Industries, Inc.
   2. Marking Services, Inc.
   3. Panduit Corp.

B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

I. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

J. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

K. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

L. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.3 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high black letters on 20-inch centers. Stop stripes at legends. Apply stripes to the following finished surfaces:
   1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
   2. Wall surfaces directly external to raceways concealed within wall.
   3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Snap-around labels. Install labels at 10-foot maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels containing the wiring system legend and system voltage. System legends shall be as follows:
   1. "EMERGENCY POWER."
   2. "POWER."
   3. "UPS."
   4. "FIRE ALARM"

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
      c. Colors for 480/277-V Circuits:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
      d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

G. Install instructional sign, including the color code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.

I. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes or self-adhesive vinyl labels with the conductor designation.

J. Conductors To Be Extended in the Future: Attach write-on tags to conductors and list source.

K. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

L. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
   1. Install underground-line warning tape for direct-buried cables and cables in raceways.

M. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

N. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
   1. Comply with 29 CFR 1910.145.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.
   4. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
      a. Power-transfer switches.
      b. Controls with external control power connections.

O. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
   1. Comply with NFPA 70E and ANSI Z535.4.
   2. Comply with Section 26 05 74 "Overcurrent Protective Device Arc-Flash Study" requirements for arc-flash warning labels.

P. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

Q. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

R. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting,

control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
2. Equipment To Be Labeled:
   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchboards.
   e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   f. Emergency system boxes and enclosures.
   g. Enclosed switches.
   h. Enclosed circuit breakers.
   i. Enclosed controllers.
   j. Variable-speed controllers.
   k. Push-button stations.
   l. Power-transfer equipment.
   m. Contactors.
   n. Remote-controlled switches, dimmer modules, and control devices.
   o. Monitoring and control equipment.
   p. UPS equipment.

END OF SECTION

SECTION 26 05 72
OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

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 a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Short-circuit study input data, including completed computer program input data sheets.
   2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

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b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Short-Circuit Study Specialist.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

C. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. SKM Systems Analysis, Inc.

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short-circuit ratings.
   2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
   3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
   4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
   5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:
   1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. Equivalent impedance.
   2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. Calculated asymmetrical fault currents:
         1) Based on fault-point X/R ratio.
         2) Based on calculated symmetrical value multiplied by 1.6.
         3) Based on calculated symmetrical value multiplied by 2.7.
   3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. No AC Decrement (NACD) ratio.

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e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.
1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

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3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
   1. To normal system low-voltage load buses where fault current is 10 kA or less.
   2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

F. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
   1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
   1. Electric utility's supply termination point.
   2. Incoming switchgear.
   3. Low-voltage switchgear.
   4. Control panels.
   5. Branch circuit panelboards.
   6. Disconnect switches.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION

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SECTION 26 05 73
OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

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 computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
   1. Study results shall be used to determine coordination of series-rated devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Coordination-study input data, including completed computer program input data sheets.
   2. Study and equipment evaluation reports.
   3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from

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Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Coordination Study Specialist.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. The following parts from the Protective Device Coordination Study Report:
         1) One-line diagram.
         2) Protective device coordination study.
         3) Time-current coordination curves.
      b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. SKM Systems Analysis, Inc.

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
   1. Optional Features:
      a. Arcing faults.
      b. Simultaneous faults.
      c. Explicit negative sequence.
      d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:
   1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.

a. Phase and Ground Relays:
   1) Device tag.
   2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
   3) Recommendations on improved relaying systems, if applicable.
b. Circuit Breakers:
   1) Adjustable pickups and time delays (long time, short time, ground).
   2) Adjustable time-current characteristic.
   3) Adjustable instantaneous pickup.
   4) Recommendations on improved trip systems, if applicable.
c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
   1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
   2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
   3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
   4. Plot the following listed characteristic curves, as applicable:
      a. Power utility's overcurrent protective device.
      b. Medium-voltage equipment overcurrent relays.
      c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
      d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
      e. Cables and conductors damage curves.
      f. Ground-fault protective devices.
      g. Motor-starting characteristics and motor damage points.
      h. The largest feeder circuit breaker in each motor-control center and panelboard.
   5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
   6. Provide adequate time margins between device characteristics such that selective operation is achieved.
   7. Comments and recommendations for system improvements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
   1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
   1. To normal system low-voltage load buses where fault current is 10 kA or less.
   2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:
   1. Device shall not operate in response to the following:
      a. Inrush current when first energized.
      b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
      c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
   2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:
   1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
   2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

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I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
   1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
   1. Electric utility's supply termination point.
   2. Switchgear.
   3. Low-voltage switchgear.
   4. Branch circuit panelboards.

M. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short-circuit ratings.
   2. Adequacy of switchgear and panelboard bus bars to withstand short-circuit stresses.
   3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

3.3 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
   1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
   2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
   3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.4 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage

profiles and analyze the effects of the motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.5 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.
   1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Architect.
   2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   2. Electrical power utility impedance at the service.
   3. Power sources and ties.
   4. Short-circuit current at each system bus, three phase and line-to-ground.
   5. Full-load current of all loads.
   6. Voltage level at each bus.
   7. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
   8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
   9. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
   10. Maximum demands from service meters.
   11. Motor horsepower and NEMA MG 1 code letter designation.
   12. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
   13. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:
      a. Special load considerations, including starting inrush currents and frequent starting and stopping.

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b. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
c. Ratings, types, and settings of utility company's overcurrent protective devices.
d. Special overcurrent protective device settings or types stipulated by utility company.
e. Time-current-characteristic curves of devices indicated to be coordinated.
f. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
g. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
h. Panelboards and switchboards and SCCR in amperes rms symmetrical.
i. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:
1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.

3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION

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SECTION 26 05 74
OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

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 a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Arc-flash study input data, including completed computer program input data sheets.
   2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Specialist.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. SKM Systems Analysis, Inc.

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Motor designations.
   4. Switchboard and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 72 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:
   1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. No AC Decrement (NACD) ratio.
      e. Equivalent impedance.
      f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
      g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:
   1. Arcing fault magnitude.
   2. Protective device clearing time.
   3. Duration of arc.
   4. Arc-flash boundary.
   5. Working distance.
   6. Incident energy.
   7. Hazard risk category.
   8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems." Produce a 3.5-by-5-inch (76-by-127-mm) thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
   1. Location designation.
   2. Nominal voltage.
   3. Flash protection boundary.
   4. Hazard risk category.
   5. Incident energy.
   6. Working distance.
   7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:
   1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 26 05 72 "Overcurrent Protective Device Short-Circuit Study."
   2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 26 05 73 "Overcurrent Protective Device Coordination Study."

C. Calculate maximum and minimum contributions of fault-current size.
   1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
   2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
   1. Fault contribution from induction motors should not be considered beyond three to five cycles.
   2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
   1. When the circuit breaker is in a separate enclosure.
   2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
   1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Architect.
   2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For reactors, provide manufacturer and model designation, voltage rating and impedance.
8. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
9. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
10. Motor horsepower and NEMA MG 1 code letter designation.
11. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:
   1. Low-voltage switchboard.
   2. Control panel.

3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION

SECTION 26 09 23
LIGHTING CONTROL DEVICES

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. Digital Lighting Controls
   2. Relay Panels
   3. Emergency Lighting Control (if applicable)

B. Related Sections:
   1. Section 26 27 26 - "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.
   2. Section 26 51 19 - LED Interior Lighting
   3. Section 26 56 13 - Lighting Poles and Standards
   4. Section 26 59 19 - LED Exterior Lighting

C. Control Intent – Control Intent includes, but is not limited to:
   1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
   2. Initial sensor and switching zones
   3. Initial time switch settings
   4. Task lighting and receptacle controls
   5. Emergency Lighting control (if applicable)

1.3 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years' experience in manufacture of lighting controls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Show installation details for the following:
      a. Occupancy sensors.
      b. Vacancy sensors.
      c. Daylighting sensors.
      d. Inwall controls.
   2. Interconnection diagrams showing field-installed wiring.
   3. Include diagrams for power, signal, and control wiring.

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1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and elevations, 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. Structural members to which equipment will be attached.
   3. Items penetrating finished ceiling, including the following:
      a. Luminaires.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Control modules.

B. Field quality-control reports.

C. Sample Warranty: For manufacturer's warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On USB media. Provide names, versions, and website addresses for locations of installed software.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Faulty operation of lighting control software.
      b. Faulty operation of lighting control devices.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION AND OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:
   1. Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

2. Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
3. Handheld remotes for personal control – One-button dimming, two-button on/off, or five-button scene remotes provide control using infrared communications. Remote may be configured in the field to control selected loads or scenes without special tools.
4. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications can provide switching, bi-level, tri-level or dimming control for daylight harvesting.
5. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
6. Digital Plug-Load Controllers – Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities.
7. Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow bi-directional communication of room variables and occupancy sensor settings. Computer software also customizes room settings.
8. Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
9. Digital Lighting Management (DLM) segment network – Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded,) to connect multiple DLM local networks for centralized control
10. Network Bridge – provides BACnet MS/TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS) and automatically creates BACnet objects representative of connected devices.
11. Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
12. Programming and Configuration software – Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.
13. LMCP Digital Lighting Management Relay Panel – provides up to 8, 24, or 48 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS).

14. Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

2.2 LIGHTING CONTROL APPLICATIONS

A. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:

1. Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.
2. Bi-Level Lighting – Provide multi-level controls in all spaces except toilet rooms, storerooms, library stacks, or applications where variable dimming is used.
3. Task Lighting / Plug Loads – Provide automatic shut off of non essential plug loads and task lighting in all spaces except toilet rooms and storerooms. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
4. Daylit Areas – Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:
   a. All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones.
   b. Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes.
   c. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.
   d. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.
5. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four (4) pre-set lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to extinguish all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.

2.3 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Watt Stopper; or a comparable product by one of the following:
   1. Cooper Industries, Inc.
   2. Lithonia Lighting; Acuity Brands Lighting, Inc.
   3. Crestron, Inc.
   4. Lutron

2.4 DIGITAL LIGHTING CONTROLS

A. Furnish the Company's system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

2.5 DIGITAL TIMER SWITCH

A. Digital time switch to automatically turn light off after set time. Adjustable time setting from five minutes to 12 hours. LCD to show time remaining. 20-amp/120 to 277 volt.

B. Wattstopper part number: TS-400.
   1. Finished Spaces: White.
   2. Kitchen Areas and Bathrooms: Gray.
   3. Unfinished Spaces: Gray.
   4. Final finishes as selected by Architect

2.6 DIGITAL WALL SWITCH OCCUPANCY SENSORS

A. Wallbox mounted passive infrared PIR or dual technology (passive infrared and ultrasonic) digital occupancy sensor with 1 or 2 switch buttons.

B. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton configuration for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   2. Programmable control functionality including:
      a. Each sensor may be programmed to control specific loads within a local network.
      b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.

c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
1) Ultrasonic and Passive Infrared
2) Ultrasonic or Passive Infrared
3) Ultrasonic only
4) Passive Infrared only

3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
4. Two RJ-45 ports for connection to DLM local network.
5. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote personal controls.
6. Device Status LEDs including:
a. PIR detection
b. Ultrasonic detection
c. Configuration mode
d. Load binding
7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
8. Assignment of local buttons to specific loads within the room without wiring or special tools
9. Manual override of controlled loads.
10. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.

C. BACnet object information shall be available for the following objects:
1. Detection state
2. Occupancy sensor time delay
3. Occupancy sensor sensitivity, PIR and Ultrasonic
4. Button state
5. Switch lock control
6. Switch lock status

D. Units shall not have any dip switches or potentiometers for field settings.

E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

F. Two-button wall switch occupancy sensors, when connected to a single relay dimming room controller, shall operate in the following sequence as a factory default:
1. Left button
a. Press and release - Turn load on
b. Press and hold - Raise dimming load

2. Right button
   a. Press and release - Turn load off
   b. Press and hold - Lower dimming load

G. Low voltage momentary pushbuttons shall include the following features:
   1. Load/Scene Status LED on each switch button with the following characteristics:
      a. Bi-level LED
      b. Dim locator level indicates power to switch
      c. Bright status level indicates that load or scene is active
   2. The following button attributes may be changed or selected using a wireless configuration tool:
      a. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
      b. Individual button function may be configured to Toggle, On only or Off only.
      c. Individual scenes may be locked to prevent unauthorized change.
      d. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
      e. Ramp rate may be adjusted for each dimmer switch.
      f. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

H. WattStopper part numbers: LMPW, LMDW. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.
   1. Third option in "Material for Finished Spaces" Subparagraph below is also available in Type 430 but is susceptible to rust and corrosion even in finished spaces.
   2. Finished Spaces: White.
   3. Kitchen Areas and Bathrooms: Gray.
   4. Unfinished Spaces: Gray.
   5. Final finishes as selected by Architect.

2.7 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR

A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton configuration for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

2. Programmable control functionality including:
   a. Each sensor may be programmed to control specific loads within a local network.
   b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
   c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
   d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
      1) Ultrasonic and Passive Infrared
      2) Ultrasonic or Passive Infrared
      3) Ultrasonic only
      4) Passive Infrared only
3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies (on dual technology sensors) for both Normal (NH) and After Hour (AH) time periods.
4. One or two RJ-45 port(s) for connection to DLM local network.
5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
6. Device Status LEDs, which may be disabled for selected applications, including:
   a. PIR detection
   b. Ultrasonic detection
   c. Configuration mode
   d. Load binding
7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
8. Manual override of controlled loads.
9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

C. BACnet object information shall be available for the following objects:
   1. Detection state
   2. Occupancy sensor time delay
   3. Occupancy sensor sensitivity, PIR and Ultrasonic

D. Units shall not have any dip switches or potentiometers for field settings.

E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

F. WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

G. Wattstopper product number (outdoor rated): EW-200.

2.8 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration. Wall switches shall include the following features:
   1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
   2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
   3. Configuration LED on each switch that blinks to indicate data transmission.
   4. Load/Scene Status LED on each switch button with the following characteristics:
      a. Bi-level LED
      b. Dim locator level indicates power to switch
      c. Bright status level indicates that load or scene is active
   5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
   6. Programmable control functionality including:
      a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
      b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
   7. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.

B. BACnet object information shall be available for the following objects:
   1. Button state
   2. Switch lock control
   3. Switch lock status

C. Two RJ-45 ports for connection to DLM local network.

D. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.

E. The following switch attributes may be changed or selected using a wireless configuration tool:
   1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
   2. Individual button function may be configured to Toggle, On only or Off only.
   3. Individual scenes may be locked to prevent unauthorized change.
   4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
   5. Ramp rate may be adjusted for each dimmer switch.
   6. Switch buttons may be bound to any load on a room controller and are not load type dependant; each button may be bound to multiple loads.

F. WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101. Available in white, light almond, ivory, grey, red and black; compatible with wall plates with decorator opening.
   1. Finished Spaces: White.
   2. Kitchen Areas and Bathrooms: Gray.
   3. Unfinished Spaces: Gray.
   4. Final finishes as selected by Architect.

2.9 HANDHELD REMOTE CONTROLS

A. Battery-operated handheld devices in 1, 2 and 5 button configurations for remote switching or dimming control. Remote controls shall include the following features:
   1. Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet.
   2. LED on each button confirms button press.
   3. Load buttons may be bound to any load on a room controller and are not load type dependant; each button may be bound to multiple loads.
   4. Inactivity timeout to save battery life.

B. A wall mount holster and mounting hardware shall be included with each remote control

C. WattStopper part numbers: LMRH-101, LMRH-102, LMRH-105.

2.10 DIGITAL PARTITION CONTROLS

A. Partition controls shall enable manual or automatic coordination of lighting controls in flexible spaces with up to four moveable walls by reconfiguring the connected digital switches and occupancy sensors.

B. Four-button low voltage pushbutton switch for manual control.
   1. Two-way infrared (IR) transceiver for use with configuration remote control.
   2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
   3. Configuration LED on each switch that blinks to indicate data transmission.
   4. Each button represents one wall; Green button LED indicates status.
   5. Two RJ-45 ports for connection to DLM local network.
   6. WattStopper part number: LMPS-104. Available in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening.

C. Contact closure interface for automatic control via input from limit switches on movable walls (by others).
   1. Operates on Class 2 power supplied by DLM local network.
   2. Includes 24VDC output and four input terminals for maintained third party contract closure inputs.
      a. Input max. sink/source current: 1-5mA
      b. Logic input signal voltage High: >18VDC
      c. Logic input signal voltage Low: <2VDC

3. Four status LEDs under hinged cover indicate if walls are open or closed; supports LMPS-104 as remote status indicator.
4. Two RJ-45 ports for connection to DLM local network.
5. WattStopper part number: LMIO-102

2.11 DIGITAL DAYLIGHTING SENSORS

A. Digital daylighting sensors shall work with room controllers to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to a room controller. Daylighting sensors shall be interchangeable without the need for rewiring.
1. Closed loop sensors measure the ambient light in the space and control a single lighting zone.
2. Open loop sensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones.
3. Dual loop sensors measure both ambient and incoming daylight in the space to insure that proper light levels are maintained as changes to reflective materials are made in a single zone.

B. Digital daylighting sensors shall include the following features:
1. The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-6,553 footcandles (fc).
3. The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.
5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.
6. Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
7. Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.
8. Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.
9. Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.

10. Configuration LED status light on device that blinks to indicate data transmission.
11. Status LED indicates test mode, override mode and load binding.
12. Recessed switch on device to turn controlled load(s) ON and OFF.
13. BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
    a. Light level
    b. Day and night setpoints
    c. Off time delay
    d. On and off setpoints
    e. Up to three zone setpoints
    f. Operating mode – on/off, bi-level, tri-level or dimming
14. One RJ-45 port for connection to DLM local network.
15. A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62" thickness (LMLS-400, LMLS-500). Extended tube photosensors accommodate mounting materials from 0.62"-1.25" thickness (LMLS-400-L, LMLS-500-L). Mounting brackets are compatible with J boxes (LMLS-MB1) and wall mounting (LMLS-MB2). LMLS-600 photosensor to be mounted on included bracket below skylight well.
16. Any load or group of loads in the room can be assigned to a daylighting zone
17. Each load within a daylighting zone can be individually enabled or disabled for discrete control (load independence).
18. All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.

C. Closed loop digital photosensors shall include the following additional features:
1. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
3. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads.
4. WattStopper Product Number: LMLS-400, LMLS-400-L.

D. Open loop digital photosensors shall include the following additional features:
1. An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room.
2. Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

3. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.
4. WattStopper Product Number: LMLS-500, LMLS-500-L.

E. Dual loop digital photosensors shall include the following additional features:
1. Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from sources outside of this con
2. Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room.
3. Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load.
4. Device must reference closed loop photosensor information as a base line reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is required.
5. Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes.
6. Device must include extendable mounting arm to properly position sensor within a skylight well.
7. WattStopper product number LMLS-600

2.12 DIGITAL ROOM CONTROLLERS AND PLUG-LOAD CONTROLLERS

A. Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard Plug n' Go applications. The control units will include the following features:
1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.
3. Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest.
4. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status
5. Quick installation features including:
   a. Standard junction box mounting

b. Quick low voltage connections using standard RJ-45 patch cable

6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
   a. Turn on to 100%
   b. Remain off
   c. Turn on to last level
7. Each load shall be configurable to operate in the following sequences based on occupancy:
   a. Auto-on/Auto-off (Follow on and off)
   b. Manual-on/Auto-off (Follow off only)
8. The polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
9. BACnet object information shall be available for the following objects:
   a. Load status
   b. Electrical current
   c. Total watts per controller
   d. Schedule state – normal or after-hours
   e. Demand response control and cap level
   f. Room occupancy status
   g. Total room lighting and plug loads watts
   h. Total room watts/sq ft
   i. Force on/off all loads
10. UL 2043 plenum rated
11. Manual override and LED indication for each load
12. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.
13. Zero cross circuitry for each load
14. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

B. On/Off Room Controllers shall include:
   1. One or two relay configuration
   2. Efficient 150 mA switching power supply
   3. Three RJ-45 DLM local network ports with integral strain relief and dust cover
   4. WattStopper product numbers: LMRC-101, LMRC-102

C. On/Off/Dimming enhanced Room Controllers shall include:
   1. Real time current monitoring
   2. Multiple relay configurations
      a. One, two or three relays (LMRC-21x series)
      b. One or two relays (LMRC-22x series)
   3. Efficient 250 mA switching power supply
   4. Four RJ-45 DLM local network ports with integral strain relief and dust cover
   5. One dimming output per relay

a. 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting. (LMRC-21x series)
b. Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads. (LMRC-22x series)
c. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.
d. The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
e. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim.
f. Calibration and trim levels must be set per output channel.
g. Devices that set calibration or trim levels per controller are not acceptable.
h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

6. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.
7. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
8. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100%
   b. Set high and low trim for each load
   c. Set lamp burn in time for each load up to 100 hours
9. Override button for each load provides the following functions:
   a. Press and release for on/off control
   b. Press and hold for dimming control
10. WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMRC-221, LMRC-222

D. Plug Load Room Controllers shall include:
1. One relay configuration with additional connection for unswitched load
2. Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay (e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated).
3. Factory default operation is Auto-on/Auto-off, based on occupancy

4. Real time current monitoring of both switched and un-switched load (LMPL-201 only)
5. Efficient switching power supply
   a. 150mA (LMPL-101)
   b. 250mA (LMPL-201)
6. RJ-45 DLM local network ports
   a. Three RJ-45 ports (LMPL-101)
   b. Four RJ-45 ports (LMPL-201)
7. WattStopper product numbers: LMPL-101, LMPL-201.

2.13 DLM LOCAL NETWORK (Room Network)

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.

B. Features of the DLM local network include:
1. Plug n' Go® automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push n' Learn® configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

C. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.

D. If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.

E. WattStopper Product Number: LMRJ-Series

2.14 DLM SEGMENT NETWORK (Room to Room Network)

A. The segment network shall be a linear topology, BACnet-based MS/TP subnet to connect DLM local networks (rooms) and LMCP relay panels for centralized control.
1. Each connected DLM local network shall include a single network bridge (LMBC-300), and the network bridge is the only room-based device that is connected to the segment network.
2. Network bridges, relay panels and segment managers shall include terminal blocks, with provisions for separate "in" and "out" terminations, for segment network connections.

3. The segment network shall utilize 1.5 twisted pair, shielded, cable supplied by the lighting control manufacturer. The maximum cable run for each segment is 4,000 feet. Conductor-to-conductor capacitance of the twisted pair shall be less than 30 pf/ft and have a characteristic impedance of 120 Ohms.
4. Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device.
5. Substitution of manufacturer-supplied cable must be pre-approved: Manufacturer will not certify network reliability, and reserves the right to void warranty, if non-approved cable is installed, and if terminations are not completed according to manufacturer's specific requirements.
6. Segment networks shall be capable of connecting to BACnet-compliant BAS (provided by others) either directly, via MS/TP, or through NB-ROUTERs, via BACnet/IP or BACnet/Ethernet. Systems whose room-connected network infrastructure require gateway devices to provide BACnet data to a BAS are unacceptable.

B. WattStopper Product Number: LM-MSTP, LM-MSTP-DB

2.15 CONFIGURATION TOOLS

A. A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include but not be limited to:
1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
3. Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number.
4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
8. Verify status of building level network devices.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

2.16 NETWORK BRIDGE

A. The network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, relay panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication and an optically isolated EIA/TIA RS-485 transceiver.
   1. The network bridge shall be provided as a separate module connected on the local network through an available RJ-45 port.
   2. Provide Plug n' Go operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
   3. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. BACnet objects will be created for the addition or replacement of any given in-room DLM device for the installed life of the system. Products requiring that an application-specific point database be loaded to create or map BACnet objects are not acceptable. Systems not capable of providing BACnet data for control devices via a dedicated BACnet Device ID and physical MS/TP termination per room are not acceptable. Standard BACnet objects shall be provided as follows:
      a. Read/write the normal or after hours schedule state for the room
      b. Read the detection state of each occupancy sensor
      c. Read the aggregate occupancy state of the room
      d. Read/write the On/Off state of loads
      e. Read/write the dimmed light level of loads
      f. Read the button states of switches
      g. Read total current in amps, and total power in watts through the room controller
      h. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
      i. Activate a preset scene for the room
      j. Read/write daylight sensor fade time and day and night setpoints
      k. Read the current light level, in footcandles, from interior and exterior photosensors and photocells
      l. Set daylight sensor operating mode
      m. Read/write wall switch lock status
      n. Read watts per square foot for the entire controlled room
      o. Write maximum light level per load for demand response mode
      p. Read/write activation of demand response mode for the room
      q. Activate/restore demand response mode for the room

B. WattStopper product numbers: LMBC-300

2.17 SEGMENT MANAGER

A. For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443).

B. Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the plans.

C. Operational features of the Segment Manager shall include the following:
   1. Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic.
   2. Easy to learn and use graphical user interface, compatible with Internet Explorer 8, or equal browser. Shall not require installation of any lighting control software to an end-user PC.
   3. Log in security capable of restricting some users to view-only or other limited operations.
   4. Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels.
   5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
   6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.
   7. Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays, and assign relays to groups. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation. Support for a minimum of 100 unique schedules, each with up to four time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules.
   8. Ability to group rooms and loads for common control by schedules, switches or network commands.
   9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
   10. Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor

state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control.

11. The Segment Manager shall allow access and control of the overall system database via Native Niagara AX FOX connectivity. Systems that must utilize a Tridium Niagara controller in addition to the programming, scheduling and configuration server are not acceptable.

D. Segment Manager shall support multiple DLM rooms as follows:
   1. Support up to 120 network bridges and 900 digital in-room devices (LMSM-3E).
   2. Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches (LMSM-6E).

E. WattStopper Product Numbers: LMSM-3E, LMSM-6E, NB-ROUTER, NB-SWITCH, NB-SWITCH-8, NB-SWITCH-16.

2.18 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

A. PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the optional LMCI-100 USB programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.
   1. Additional parameters exposed through this method include but are not limited to:
      a. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
      b. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
      c. Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.
      d. Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.
      e. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
      f. Load control polarity reversal so that on events turn loads off and vice versa.
      g. Per-load DR (demand response) shed level in units of percent.
      h. Load output pulse mode in increments of 1second.
      i. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.

2. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
   a. Device list report: All devices in a project listed by type.
   b. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
   c. BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.
   d. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
   e. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.
   f. Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).
   g. Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors.
3. Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations:
   a. Set, copy/paste an entire project site of sensor time delays.
   b. Set, copy/paste an entire project site of sensor sensitivity settings.
   c. Search based on room name and text labels.
   d. Filter by product type (i.e. LMRC-212) to allow parameter set by product.
   e. Filter by parameter value to search for product with specific configurations.
4. Network-wide firmware upgrading remotely via the BACnet/IP network.
   a. Mass firmware update of entire rooms.
   b. Mass firmware update of specifically selected rooms or areas.
   c. Mass firmware upgrade of specific products.

B. WattStopper Product Number: LMCS-100, LMCI-100

2.19 LMCP LIGHTING CONTROL PANELS

A. Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:
   1. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays, 1 - 24 relays and 6 four-pole contactors, or 1 - 48 relays and 6 four-pole contactors.
   2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
   3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for

mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:

a. Removable, plug-in terminal blocks with connections for all low voltage terminations.
b. Individual terminal block, override pushbutton, and LED status light for each relay.
c. Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only.
d. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO modules capable of receiving momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices.
e. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.
f. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
g. Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99.
h. Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.
i. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
    1) Electrical:
        a) 30 amp ballast at 277V
        b) 20 amp ballast at 347V
        c) 20amp tungsten at 120V
        d) 30 amp resistive at 347V
        e) 1.5 HP motor at 120V
        f) 14,000 amp short circuit current rating (SCCR) at 347V
        g) Relays shall be specifically UL 20 listed for control of plug-loads
    2) Mechanical:
        a) Replaceable, ½" KO mounting with removable Class 2 wire harness.
        b) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
        c) Dual line and load terminals each support two #14 - #12 solid or stranded conductors.
        d) Tested to 300,000 mechanical on/off cycles.

4. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
5. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.
6. Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon loss of normal power. Panels shall be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 - Article 700.
7. Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control.
   a. Each panel shall include digital clock capability able to issue system wide automation commands to up to (11) eleven other panels for a total of (12) twelve networked lighting control panels. The clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups.
   b. The clock capability of each panel shall support the time-based energy saving requirements of applicable local energy codes.
   c. The clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for the clock function and program retention in non-volatile FLASH memory. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed.
   d. The clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
      1) Scheduled ON / OFF
      2) Manual ON / Scheduled OFF
      3) Astro ON / OFF (or Photo ON / OFF)
      4) Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
   e. The user interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)
   f. The clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years.
   g. Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable.
8. The lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions, as configured in a Segment Manager controller, via a segment network connection.
9. The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation

systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet® protocol.

a. The panel shall have provision for an individual BACnet device ID and shall support the full 2^{22} range (0 – 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network.
b. The panel shall support MS/TP MAC addresses in the range of 0 – 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second.
c. Lighting control relays shall be controllable as binary output objects in the instance range of 1 – 64. The state of each relay shall be readable and writable by the BAS via the object present value property.
d. Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 – 64.
e. The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 – 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode.
f. Setup and commissioning of the panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:
    1) Binary output objects in the instance range of 1 – 64 (one per relay) for on/off control of relays.
    2) Binary value objects in the instance range of 1 – 99 (one per channel) for normal hours/after hours schedule control.
    3) Binary input objects in the instance range of 1 – 64 (one per relay) for reading true on/off state of the relays.
    4) Analog value objects in the instance range of 101 – 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.
g. The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.
h. The BO and BV 1 – 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa. (http://www.bacnet.org/Addenda/Add-135-2010aa.pdf)

i. Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object.

j. Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196.

10. WattStopper Product Number: LMCP8, LMCP24 or LMCP48

2.20 USER INTERFACE

A. Each lighting control panel system shall be supplied with at least (1) handheld configuration tool (LMCT-100). As a remote programming interface the configuration tool shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following panel-specific functions as a minimum:

1. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
2. Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.
3. Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.
4. Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.
5. Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.
6. Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.
7. An additional handheld IR remote may optionally be specified to be permanently mounted to the panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel while assuring that the handheld programmer is always present at that panel. An unlimited number of handheld IR remotes may also be purchased for facilities staff as determined by the end user's representative.

B. WattStopper Product Number: LMCT-100

2.21 EMERGENCY LIGHTING CONTROL DEVICES

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal

ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120/277 volts, 50/60 Hz, 20 amp ballast rating
2. Push to test button
3. Auxiliary contact for remote test or fire alarm system interface

B. WattStopper Product Numbers: ELCU-100, ELCU-200.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:

1. Discuss final selections of devices, including occupancy sensors, sensor switches, wall mount button control switches with dimmers, etc. Submit to architect and engineer for final approval.
2. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.
3. Review the specifications for low voltage control wiring and termination.
4. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
5. Discuss requirements for integration with other trades.

3.2 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SENSOR INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.4 CONTACTOR INSTALLATION

A. Comply with NECA 1.

B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.5 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch (13 20 mm).

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.6 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

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2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 FACTORY SERVICES

A. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with three weeks written notice of the system start up and adjustment date.

C. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.9 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.10 ACCEPTANCE TESTING SUPPORT SERVICES

A. On all California projects, a certified lighting controls acceptance test technician (CLCATT) must verify the installation of the lighting control system. Manufacturer should include an extra day of factory technician's time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms. It will be the CLCATT's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the CLCATT with this task.

3.11 COMMISSIONING SUPPORT SERVICES

A. On this project, a commissioning agent will be hired to verify the installation and programming of all building systems, which includes the lighting control system. Manufacturer should include an extra day of technician's time to review the functionality and settings of the lighting control hardware with the commissioning agent, including reviewing submittal drawings and ensuring that instructions on

how to configure each device are readily available. Manufacturer is NOT responsible for helping the commissioning agent inspect the individual devices. It will be the commissioning agent's responsibility to create and complete any forms required for the commissioning process, although the manufacturer or contractor may offer spreadsheets and/or printouts to assist the agent with this task.

B. The commissioning agent shall work with the electrical contractor during installation of the lighting control hardware to become familiar with the specific products. The agent may also accompany the manufacturer's technicians during their start-up work to better understand the process of testing, calibration and configuration of the products. However, the contractor and manufacturer shall ensure that interfacing with the agent does not prevent them from completing the requirements outlined in the contract documents.

3.12 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.13 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Section 26 09 23 "Lighting Control Devices" and Section 26 09 23.02 "Lighting Controls."

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

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. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.
   3. Electronic-grade panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
   1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
   2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details.
   2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
   3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   4. Detail bus configuration, current, and voltage ratings.

5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

C. Provide ¼" scale drawing demonstrating that installation has been coordinated with work of other trades. Use actual dimensions from approved equipment submittals to coordinate layout and installation of transformers and components with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

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. Keys: Two spares for each type of panelboard cabinet lock.
   2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
   3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

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1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
      b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet.

C. 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 Construction Manager no fewer than two days in advance of proposed interruption of electric service.
   2. Do not proceed with interruption of electric service without Owner's written permission.
   3. Comply with NFPA 70E.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards 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 a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
      c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
      d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
      e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   2. Height: 84 inches maximum.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
   4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
   5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
   6. Finishes:
      a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
      b. Back Boxes: Same finish as panels and trim.
      c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

F. Incoming Mains:
   1. Location: Convertible between top and bottom.
   2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Phase, Neutral, and Ground Buses:
   1. Material: Hard-drawn copper, 98 percent conductivity.

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a. Plating shall run entire length of bus.
b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.

H. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Compression type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
9. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: Ten percent.

K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
   1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
   2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards 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."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. General Electric Company; GE Energy Management - Electrical Distribution.
   3. Siemens Energy.
   4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. General Electric Company; GE Energy Management - Electrical Distribution.

3. Siemens Energy.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only as indicated on schedule.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.

F. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.
1. Doors: Concealed hinges secured with multipoint latch with tumbler lock; keyed alike.

2.5 SPLIT BUS AND SEPARATED DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Energy.
4. Square D; by Schneider Electric.

B. Split bus panelboards shall be designed as multiple sections within a single enclosure. The electrical connection between sections shall be a single branch breaker in the upstream section wired to a single branch breaker or subfeed lugs in the receiving section. Configurations shall be one of the following and in accordance with the panel schedules:
1. Up to 240VAC 3 phase:
   a. 20" wide
   b. 5.75" deep for NEMA 1
   c. 18 circuit main section & 30 circuit second section. Maximum 44" high with main lugs only or 56" high with main circuit breaker.
   d. 30 circuit main section & 18 circuit second section. Maximum 44" high with main lugs only or 56" high with main circuit breaker.
   e. 30 circuit main section & 30 circuit second section. Maximum 44" high with main lugs only or 56" high with main circuit breaker.
   f. 30 circuit main section, 18 circuit second section and 18 circuit third section. Maximum 50" high with main lugs only or 62" high with main circuit breaker.

2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. General Electric Company; GE Energy Management - Electrical Distribution.
   3. Siemens Energy.
   4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.
      c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic Trip Circuit Breakers:
      a. RMS sensing.
      b. Field-replaceable rating plug or electronic trip.
      c. Digital display of settings, trip targets, and indicated metering displays.
      d. Multi-button keypad to access programmable functions and monitored data.
      e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
      f. Integral test jack for connection to portable test set or laptop computer.
      g. Field-Adjustable Settings:
         1) Instantaneous trip.
         2) Long- and short-time pickup levels.
         3) Long and short time adjustments.
         4) Ground-fault pickup level, time delay, and I squared T response.
   4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
   5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
   6. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
   7. Subfeed Circuit Breakers: Vertically mounted.
   8. MCCB Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Breaker handle indicates tripped status.
      c. UL listed for reverse connection without restrictive line or load ratings.
      d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
      e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.

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f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 26 23 13 "Electrical Power."
h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
i. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
j. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
k. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
l. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
m. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
n. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
o. Multipole units enclosed in a single housing with a single handle.
p. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
q. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.7 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.
1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.8 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407.

D. Equipment Mounting:
   1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 10 "Cast-in-Place Concrete."
   2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
   3. Comply with requirements for seismic control devices specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

G. Mount top of trim 90 inches above finished floor unless otherwise indicated.

H. Mount panelboard cabinet plumb and rigid without distortion of box.

I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

J. Mounting panelboards with space behind is recommended for damp, wet, or dirty locations. The steel slotted supports in the following paragraph provide an even mounting surface and the recommended space behind to prevent moisture or dirt collection.

K. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

L. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

M. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

N. Install filler plates in unused spaces.

O. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

P. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

Q. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. 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 panelboard. 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 panelboard 11 months after date of Substantial Completion.
      c. Instruments and Equipment:
         1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 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 05 73 "Overcurrent Protective Device Coordination Study."

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3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

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SECTION 26 27 26
WIRING DEVICES

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. Twist-locking receptacles.
   2. Convenience receptacles.
   3. Tamper-resistant receptacles.
   4. Weather-resistant receptacles.
   5. Pendant cord-connector devices.
   6. Floor service outlets, and multioutlet assemblies.
   7. Cord Reel Receptacles

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

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1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 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.

1.8 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. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
   2. Hubbell Incorporated; Wiring Device-Kellems.
   3. Leviton Manufacturing Co., Inc.
   4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 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:

2.3 TWIST-LOCKING RECEPTACLES

A. 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, provide products by one of the following:
      a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
      b. Hubbell Incorporated; Wiring Device-Kellems.
      c. Leviton Manufacturing Co., Inc.
      d. Pass & Seymour/Legrand (Pass & Seymour).

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
      b. Hubbell Incorporated; Wiring Device-Kellems.
      c. Leviton Manufacturing Co., Inc.
      d. Pass & Seymour/Legrand (Pass & Seymour).
   2. Description:
      a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
      b. 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.

2.4 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: Industrial grade, decorator style (square face), 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).

B. Controlled Convenience Receptacles, Industrial grade, decorator style (square face), 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification W-C-596. Marking permanently printed, molded, or stamped on the face of the receptacle and in compliance with Controlled Receptacle Marking requirements stated in Article 406.3(E) of the 2014 National Electrical Code.

2.5 USB CHARGER DEVICES

A. Tamper-Resistant, USB Charger Receptacles: Industrial grade, decorator style (square face), 125 V, 20 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, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
   3. USB Receptacles: Single, Type A.
   4. Line Voltage Receptacles: Single, two pole, three wire, and self-grounding.

2.6 GFCI RECEPTACLES

A. General Description:
   1. Industrial grade, decorator style (square face), 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).

2.7 FINISHES

A. Device Color connected to normal power system:
   1. Finished Spaces: White.
   2. Bathrooms: Gray.
   3. Unfinished Spaces: Gray.
   4. Wet-Locations (concealed with weatherproof cover plate; see wall plates): Gray.
   5. Floor Boxes: Gray.
   6. Final finishes as selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wiring devices connected to emergency power system: Red.

C. Match device color so that gray devices have stainless steel plates and white devices have white plates.

2.8 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, plastic nylon. White.
   3. Material for Bathrooms: 0.040 inch stainless steel, satin finish.
   4. Material for Unfinished Spaces: Galvanized steel.
   5. Surface Raceways and Floor Boxes: Stainless Steel. Blank plates to match.
   6. Final finishes as selected by Architect.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum, with continuous use, lockable cover.

C. Match wall plate color so that gray devices have stainless steel plates and white devices have white plates.

2.9 FLOOR SERVICE FITTINGS

A. Manufacturers: FSR Inc. FL-500P-3", 3-inch deep box.

B. KO trade sizes: 1"C concentric for power and 1-1/4"C concentric for telecommunications.

C. Type: Modular, flush-type, dual-service units suitable for wiring method used.

D. Compartments: Barrier separates power from voice and data communication cabling. Provide Plate Configuration 4 on one side for power. On the other side, provide Configuration 4 for telecommunications.

E. Service Cover Plate: Stainless steel cover with no flange and hinged door. FL-500P-SS-C.

F. Pour Pan. FL-GRD2.

G. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

H. Voice and Data Communication Outlet: Six modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.10 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.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide decorator type devices.

B. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

C. 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.

D. 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. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

E. 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 (152 mm) 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.

F. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

G. 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.

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 FLOOR SERVICE FITTINGS

A. Route one 1"C for power and two 1-1/4"C for telecommunications from wall to each floor box.

B. Plate Configuration 4 on one side for power. Four duplex receptacles shall be provided where one receptacle is controlled.

C. On the other side, provide Plate Configuration 4 for telecommunications. One 6 port telecommunications outlet with 6 CAT6 cabling and 6 data jacks will be provided.

D. Provide blank plates to cover unused openings.

3.3 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.4 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

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.

3.5 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. Test Instruments: Use instruments that comply with UL 1436.
2. 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. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

E. See Section 01 40 00 "Quality Requirements" for retesting and reinspecting requirements and Section 01 73 00 "Execution Requirements" for requirements for correcting the Work.

F. Wiring device will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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 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."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include 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 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.

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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.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification 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. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
   1. 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.

1.8 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.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. 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.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.10 PROJECT 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.

1.11 COORDINATION

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.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Sector; Eaton Corporation.
   2. General Electric Company.
   3. Siemens Industry, Inc.
   4. Square D; by Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, 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, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, 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, capable of being grounded and bonded; 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: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   6. Hookstick Handle: Allows use of a hookstick to operate the handle.
   7. Lugs: Compression type, suitable for number, size, and conductor material.
   8. Service-Rated Switches: Labeled for use as service equipment.
   9. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Sector; Eaton Corporation.
   2. General Electric Company.
   3. Siemens Industry, Inc.
   4. Square D; by Schneider Electric.

B. Type GD, General Duty, Single Throw, 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.

C. Type HD, Heavy Duty, 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, 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, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Compression type, suitable for number, size, and conductor material.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.3 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann; a division of Cooper Industries.
2. Littelfuse, Inc.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:
1. Oiltight key switch for key-to-test function.
2. Oiltight red ON pilot light.
3. Isolated neutral lug; 100 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 coil voltage.

7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Sector; Eaton Corporation.
   2. General Electric Company.
   3. Siemens Industry, Inc.
   4. Square D; by Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current 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.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. 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^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. 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.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: 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 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: Integral communication module with functions and features compatible with power monitoring and control system, specified in Section 26 09 13 "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 electronic 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;.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
   4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   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.

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.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

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C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

E. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. 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.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 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 05 73 "Overcurrent Protective Device Coordination Study."

END OF SECTION

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SECTION 26 51 19
LED INTERIOR LIGHTING

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. Interior solid-state luminaires that use LED technology.
   2. Lighting fixture supports.

B. Related Requirements:
   1. Section 26 09 23.02 "Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include emergency lighting units, including batteries and chargers.
   5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project.

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a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.
1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 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. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:
a. Other luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Ceiling-mounted projectors.
7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, 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.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
   1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
   2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
   3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Mockups: For interior lighting luminaires in room or module mockups, complete with power and control connections.
   1. Obtain Architect's approval of luminaires in mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
   1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Recessed Fixtures: Comply with NEMA LE 4.

E. Bulb shape complying with ANSI C79.1.

F. Lamp base complying with ANSI C81.61 or IEC 60061-1.

G. CRI of minimum 80. CCT of 4000 K. Unless otherwise indicated on luminaire schedule.

H. Rated lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: as scheduled.
   1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.3 MATERIALS

A. Metal Parts:
   1. Free of burrs and sharp corners and edges.
   2. Sheet metal components shall be steel unless otherwise indicated.
   3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning and relamping.
   3. Provide support for luminaire without causing deflection of ceiling or wall.
   4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 2609 23.02 "Lighting Controls."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
   2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 26 56 19
EXTERIOR LIGHTING

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. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
   2. Luminaire supports.
   3. Luminaire-mounted photoelectric relays.

B. Related Requirements:
   1. Section 26 09 23"Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
   2. Section 26 09 23.02 "Lighting Controls".

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaire.
   4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
   5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps

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and accessories identical to those indicated for the luminaire as applied in this Project.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture indicated with factory-applied finish.

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For luminaire supports.
1. Include design calculations for luminaire supports and seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, 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.

D. Product Certificates: For each type of the following:
1. Luminaire.
2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

F. Source quality-control reports.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

F. Mockups: For exterior luminaires, complete with power and control connections.
   1. Obtain Architect's approval of luminaires in mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures, including luminaire support components.
      b. Faulty operation of luminaires and accessories.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
   1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. Bulb shape complying with ANSI C79.1.

G. CRI of minimum 80. CCT of 4000 K. Unless otherwise indicated on luminaire schedule.

H. L70 lamp life of 50,000 hours. Unless otherwise indicated on luminaire schedule.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: as scheduled

L. In-line Fusing: On the primary for each luminaire.

M. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

N. Source Limitations: Obtain luminaires from single source from a single manufacturer.

O. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

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B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter, shape, size, wattage and coating.
      c. CCT and CRI for all luminaires.

2.5 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Wiring Method: Install cables in raceways. Conceal raceways and cables.

F. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.

G. Coordinate layout and installation of luminaires with other construction.

H. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

I. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 BOLLARD LUMINAIRE INSTALLATION:

A. Align units for optimum directional alignment of light distribution.
1. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

3.5 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

3.6 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

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B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Verify operation of photoelectric controls.

C. Illumination Tests:
   1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
      a. IES LM-5.
      b. IES LM-50.
      c. IES LM-52.
      d. IES LM-64.
      e. IES LM-72.
   2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
   2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

SECTION 28 13 00
ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish and install a complete microprocessor controlled, PC Programmable multi-door access control system as described herein and shown on the plans. The system shall include all necessary boards, power supplies, keypads, loudspeakers, special mounting boxes, cable, connectors, and accessories for a complete operational system.

B. Scope of work shall include card, digital and RF transmitter access control for up to 3000 users and up to 8000 card access device codes.

1.2 RELATED SECTIONS

A. Section 03 10 00 Concrete Formwork and Accessories

B. Section 03 30 00 Cast-in-Place Concrete

C. Section 11 12 00 Parking Control Equipment

D. Section 26 05 19 Low-Voltage Electrical

E. Section 26 05 33 Underground Ducts And Raceways For Electrical

1.3 RELATED WORK

A. Contractor shall coordinate all work with other contractors and trades where necessary.

B. All necessary conduit, raceways, pull boxes, standard boxes, (and special boxes provided by intercom manufacturer), shall be installed by the electrical contractor.

C. Installation of the communication/access systems shall be coordinated with the installation of other related systems.

1.4 REFERENCES

A. Underwriter Laboratories Inc. (UL), UL 294

B. Federal Communications Commission (FCC).

1.5 QUALITY ASSURANCE

A. Installation shall comply with all applicable codes.

B. All equipment shall be new, in current production, and the standard products of a manufacturer of access control equipment.

C. Manufacturer shall guarantee availability of parts, for a minimum of 7-years from date of shipment.

D. If required, manufacturer shall be able to demonstrate features, functions and operating characteristics.

E. System shall be installed by a factory authorized contractor, with technicians specifically trained in this system.

F. On-site maintenance and repair service shall be available locally and within 4-hours, of notification for emergency condition.

G. System shall interface with other DoorKing systems to allow remote PC programming.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shall include an equipment list, and data sheet, system description and block diagrams on equipment to be finished.

C. Shall include all data necessary to evaluate design, quality, and configuration of proposed equipment and system(s).

1.7 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 70 00.

B. Submit operation data for gate controls.

C. Submit maintenance data for gate operator.

1.8 QUALIFICATIONS

A. Installer: Company specializing in installing the Work of this Section with minimum three years documented experience, approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 87 00.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate Work under provisions of Section 01 31 19.

B. Coordinate requirements and installation of electrical Work.

1.11 WARRANTY

A. Provide one year warranty under provisions of Section 01 70 00.

B. Systems shall include a factory warranty that equipment is free from defects in design, material, manufacturing and operation.

C. Factory warranty period shall be for two (2) years parts and workmanship; 24-months from date of shipment. Manufacturer shall not be responsible for improper use, handling, or installation of the product.

D. Installing communications contractor shall guarantee the equipment, wire, cable, and installation for 12-months from date of acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Basis of Design: DoorKing, Inc., (800) 826-7493.

2. Approved equal.

B. Basis of Design Product
1. DoorKing 1838 Access Controller
2. DoorKing 1815-250 Wiegand Keypad / Card Reader
3. DoorKing 1200-036 Small Offset Post Architectural
4. DoorKing 1401-080 Access Control Lock Box with Knox 3501 Key Switch (for Local Fire Authority Access)

2.2 SYSTEM DESCRIPTION

A. The system shall be capable of storing up to 3000 user names and phone numbers (all models), and up to 8000 card, digital, and/or RF transmitter access codes.

B. The system transaction buffer shall store up to 8000 events.

C. The system shall be capable of being programmed via a personal computer and DoorKing Remote Account Manager for Windows software (included with the system). Several different methods of connection to the system shall be made available:
1. Internet (VoIP)

D. The system shall be able to download the transaction buffer to the PC for analysis.

E. 32 Holiday Schedules shall be user programmable.

F. The system shall be capable of providing “True” anti-pass back in 2 different modes of operation:
   1. Passive mode shall report anti-pass back violations but will allow entry.
   2. Active mode shall report anti-pass back violations and will not allow entry .

G. The system shall have an “Import / Export” feature to allow database transfer between to or from common spreadsheet programs.

H. Eight (8) hold open time zones shall allow designated access points to be 'un-locked' at times and days as required.

I. Access Control Devices: compatible with standard 26-bit wiegand access devices:
   1. Provide Card access by proximity card readers DoorKing P/N 1815-250 Wiegand Keypad / Card Reader
   2. Provide 100 proximity cards that function with system. Program ready for use.
   3. Provide Wiegand Keypad DoorKing P/N 1815-250 Wiegand Keypad / Card Reader.

J. Cabinet
   1. Cabinet is constructed from 16-gauge steel and is lockable, gasketed, NEMA 4 rated enclosure.
   2. The system shall include a built-in keypad for on-site programming

K. Dimensions
   1. Surface Mount: 10 1/4 inches high, 12 1/4 inches wide, 4 1/4 inches deep.

L. Mounting Post
   1. Provide mounting plate large enough for mounting of access controlreader/keypad housing and Local Fire Authority Access Control Lock Box.

M. Local Fire Authority Control Lock Box.
   1. Provide Access Control Lock Box with Knox Key Switch. Verify with Local Fire Authority for proper lock keying.

2.3 OPTIONS

A. Connection Options

1. TCP/IP 1830-185. Closed Local Area Network

PART 3 - EXECUTION

3.1 INSTALLATION

A. Should be installed by qualified technicians who have been factory trained.
B. Wiring shall be uniform and in accordance with national electric codes and manufacturers instructions.

C. Conform to the manufacturers written requirements for installation.

D. Equipment shall be firmly secured, plumb, and level.

E. All splices shall be in easily accessible junction boxes or on terminal boards.

F. All cable runs at the main control cabinets, in all auxiliary cabinets and at all phone blocks shall be tagged and identified.

G. Coordinate all work with other effected trades and contractors.

H. Fastenings:

1. Fasten on gypsum board wall surfaces with screws into wood or metal blocking, or with bolts or molly anchors, not less than 1/4" diameter. Screwing into gypsum board or plaster with plugs will not be acceptable.

3.2 SYSTEM INITIALIZING AND PROGRAMMING

A. System shall include all software and/or instructions necessary for system configuration.

B. System shall be turned on and adjustment made to meet requirements of specifications and on-site conditions.

C. System shall be programmed to function as specified.

D. Directory numbers, feature codes, and special programming shall be documented, printed and made available to all owners.

3.3 SYSTEM TEST PROCEDURES

A. System shall be completely tested to assure that the exchange and all components, stations, speakers, and accessories are hooked-up and in working order.

B. System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.

C. System shall be tested in presence of owner's representative.

3.4 OWNER INSTRUCTIONS

A. Installation contractor shall conduct up to (4) hours of instruction in use and operation of the system to designated owner representatives, within (30) days of acceptance.

B. Installation contractor shall conduct up to (4) hours of technical training, in programming, troubleshooting, and service of the system, to designated owner representatives within (90) days of system acceptance.

3.5 MANUALS AND DRAWINGS

A. Contractor shall provide owner with two copies of standard factory prepared operation, installation and maintenance manuals. Manuals shall include typical wiring diagrams.

B. Contractor shall provide owner with two copies of any risers, layouts, and special wiring diagrams showing any changes to standard drawings, if required on project.

END OF SECTION

SECTION 28 31 11
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM (DELEGATED DESIGN)

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. Work under this section consists of all engineering, installation labor, materials, equipment, programming, services, permits, fees and transportation necessary for, and/or reasonably incidental to, the construction and completion in working order of the work specified herein.

B. Work includes, but is not limited to the following:
1. Complete system design, engineering, testing and final acceptance by Owner and Authority having jurisdiction.
2. Life safety fire alarm detection and signaling system.
3. Plan check approval.
4. Furnishing and installation of equipment and devices.
5. Wiring in Conduit and connections.
6. Interface with elevator controls.
7. Programming, testing per NFPA 72, cleaning, adjusting of completed work.
8. Wiring diagrams, shop drawings, equipment data.
9. Complete warranty for five years. Proposal for subsequent maintenance contract including service, testing and repair or replacement..
10. All work and material for complete and operable systems as indicated or specified.
11. As constructed record drawings.
12. Permits, inspections, fees.
13. Identification and instruction in writing.
14. Coordination with existing conditions and work of other trades.
15. Furnishing of special back boxes for installation under electrical section.
16. Extending 120 volt power from electrical panelboard, coordinating and updating load schedules with Owner.

C. Section Includes:
1. Fire-alarm control unit.
2. System smoke detectors.
3. Heat detectors.
4. Notification appliances.
5. Remote annunciator.
6. Addressable interface device.
7. Digital alarm communicator transmitter.

D. Related Requirements:

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1. Section 28 05 13 "Conductors and Cables for Electronic Safety and Security" for cables and conductors for fire-alarm systems.
2. Section 28 05 44 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling".

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.
1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Product Samples: For each device provide product sample for color and product review.

C. Shop Drawings: For fire-alarm system.
1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

11. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
12. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
13. Extend 120 volt power from electrical panelboard, coordinating and updating load schedules with Owner.

D. General Submittal Requirements:
1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified, fire-alarm technician; Level III minimum.
   c. Licensed or certified by authorities having jurisdiction.

E. Administrative
1. Permit application
2. Pay all plan review and inspection fees
3. Include the following installing contractors information:
   a. Installing contractors name, address phone number.
   b. Contractors license number.
   c. Local business license number.
   d. Include a copy of workers compensation insurance certificate.
   e. Evidence of Contractor personnel NICET Certification.
   f. List of contractor personal who will be working on the installation.
4. Include the following Project information:
   a. Site address.
   b. Basis for installation / Building code occupancy classification.

F. Fire alarm equipment
1. Include manufacturers specification sheets for all components
2. Identify equipment application per listing and approvals
3. Include CSFM listing sheets for all required systems and components numbers

G. General information
1. Indicate appropriate codes and standards, including reference edition.
2. Indicate type of system or service involved.
3. Include written sequence of operation or matrix table.
4. Indicate HVAC equipment locations and CFM.
5. Indicate any special system features or operations.
6. Indicate all required identification and labeling. Include locations for each item and proposed nomenclature.

H. Plans and details
1. Include the following information:
   a. Scaled reflected ceiling and floor plans, including north reference.

b. Completed title block indicating project site address and installing contractors address.
c. Identify each room and its proposed use.
d. Locate all devices, cabinets and components including end of line devices.
e. Accurate legend of symbols for all fire alarm devices being installed, conforming with construction documents.
f. Identify circuit styles, designations and methods.
g. Include building cross sections, include attic, soffit or ceiling details.
h. Indicate location of sprinkler system test valve.
i. Include voltage drop calculations.
j. Include description of zone assignments / device addresses.
k. Indicate through penetration fire stopping details and specifications.
l. Include reflected ceiling plans showing duct diffusers, lighting fixtures, sprinklers, speakers, ceiling types and changes in elevations. Locate all fire alarm ceiling mounted devices in relation to work of other trades and other ceiling components.
m. Elevation detail of manual pull station installation and visual alarm signaling devices. Note that existing device mounting heights and locations may not comply with current codes.
n. Indicate device mounting heights coordinated with architectural elevations for wall mounted initiation and notification devices.
o. Include power supply source and details.

I. Riser diagram
1. Indicate conductor information:
   a. Size.
   b. Stranding.
   c. Insulation type.
2. Identification of wire quantities and conduit or raceway sizes.
3. Include conduit fill calculations.
4. Indicate locations for end of line devices

J. Additional requirements
1. Point-to-point wiring diagrams for overall system and components, including 120 volt power distribution and interface with the HVAC and fire protection systems .
2. Typical device wiring diagrams.
3. Battery calculations to meet AHJ minimum hour requirements..
4. Details for support and anchorage of all fire alarm equipment weighing over 20 pounds.
5. Include physical and electrical characteristics of equipment to indicate conformance with the specifications.
6. Annunciator configuration and designations.
7. Revised panel schedules showing 120 volt circuit loads.
8. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
9. Device Address List: Coordinate with final system programming.

10. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
12. Audible/visual/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Data: Certificates, for fire-alarm control unit, 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 Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.

g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
   1) Equipment tested.
   2) Frequency of testing of installed components.
   3) Frequency of inspection of installed components.
   4) Requirements and recommendations related to results of maintenance.
   5) Manufacturer's user training manuals.
i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.8 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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
   3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
   4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
   5. Keys and Tools: One extra set for access to locked or tamper proofed components.
   6. Audible and Visual Notification Appliances: One of each type installed.
   7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

B. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.10 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
   1. Do not proceed with interruption of fire-alarm service without Owner's written permission.

C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.11 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service, and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
   1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DEVICE MANUFACTURER

A. FACP: Siemens XLSV, CSFM 7165-0067:0222

B. Smoke Detector: Siemens FP-11, CSFM 7272-0067:0203

C. Heat Detector: Siemens FPT-11, CSFM 7270-0067:0202

D. Speaker/Strobe: Siemens SEFH-HMC-R, CSFM 7125-0067:0272

E. Speaker: Siemens SEFH-R, CSFM 7320-0067:0273

2.2 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and voice/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:
1. Manual stations.
2. Heat detectors.
3. Smoke detectors.

B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances, including voice evacuation notices.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Activate voice/alarm communication system.
5. Activate emergency lighting control.
6. Record events in the system memory.
7. Record events by the system printer.
8. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. User disabling of zones or individual devices.
2. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.

6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.
11. Hose cabinet door open.

E. System Supervisory Signal Actions:
1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways 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."

2.5 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components

including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, two line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
   1. Pathway Class Designations: NFPA 72, Class B.
   2. Pathway Survivability: Level 0.
   3. Install no more than 50 addressable devices on each signaling-line circuit.
   4. Serial Interfaces:
      a. One dedicated RS 485 port for remote station operation using point ID DACT.
      b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
      c. One USB port for PC configuration.
      d. One RS 232 port for voice evacuation interface.

D. Smoke-Alarm Verification:
   1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
   2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
   3. Record events by the system printer.
   4. Sound general alarm if the alarm is verified.
   5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

E. Notification-Appliance Circuit:
   1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
   2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
   3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

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H. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center.
   1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.
      a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
      b. Programmable tone and message sequence selection.
      c. Standard digitally recorded messages for "Evacuation" and "All Clear."
      d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.
   2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
   3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
   1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
   1. Batteries: Sealed lead calcium.

K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.6 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:
   1. Comply with UL 268; operating at 24-V dc, nominal.
   2. Detectors shall be four-wire type.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
   4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
   a. Multiple levels of detection sensitivity for each sensor.
   b. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

2.7 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.
1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Speakers, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Speakers, High-Level Output: Vibrating type, 81-dBA minimum rated output.

D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
   1. Rated Light Output:
      a. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.
   6. Mounting Faceplate: Factory finished, red.

F. Voice/Tone Notification Appliances:
   1. Comply with UL 1480.
   2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
   3. Low-Range Units: Rated 1 to 2 W.
   4. Mounting: semi recessed.
   5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

G. Exit Marking Audible Notification Appliance:
   1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
   2. Provide exit marking audible notification appliances at the entrance to all building exits.
   3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
   1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s)

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and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:
   1. Verification that both telephone lines are available.
   2. Programming device.
   3. LED display.
   4. Manual test report function and manual transmission clear indication.
   5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:
   1. Address of the alarm-initiating device.
   2. Address of the supervisory signal.
   3. Address of the trouble-initiating device.
   4. Loss of ac supply.
   5. Loss of power.
   6. Low battery.
   7. Abnormal test signal.
   8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
   1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
   1. Devices placed in service before all other trades have completed cleanup shall be replaced.
   2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
   1. Connect new equipment to existing control panel in existing part of the building.
   2. Connect new equipment to existing monitoring equipment at the supervising station.
   3. Expand, modify, and supplement existing monitoring equipment as necessary to extend existing monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

D. Smoke- or Heat-Detector Spacing:
   1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
   2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
   3. Smooth ceiling spacing shall not exceed 30 feet.
   4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A in NFPA 72.
   5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
   6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

G. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating

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mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS

A. Pathways above recessed ceilings and in non-accessible locations may be routed exposed.
   1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 08 71 00 "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Data communication circuits for connection to building management system.
   2. Data communication circuits for connection to mass notification system.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 27 05 53 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
   5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
   6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

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SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removing existing vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Section 015000 "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities**,** and temporary erosion- and sedimentation-control measures.
2. Section 017300 "Execution" for field engineering and surveying.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain SCHOOL DISTRICT's property, cleared materials shall become subcontractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference if requested by OWNER.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from SCHOOL DISTRICT and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by ENGINEER or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged or discovered on site and store on SCHOOL DISTRICT's premises per SCHOOL DISTRICT direction.

C. Utility Locator Service: Notify SCHOOL DISTRICT for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction material, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.

6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

H. Soil Stripping, Handling, and Stockpiling: Perform as directed by geotechnical report**.**

I. Potential non-reusable soil – SCHOOL DISTRICT shall remove or provide information on the location of any soil that does not meet SCHOOL DISTRICT internal soil reuse policy.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to SCHOOL DISTRICT.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection." Protect California red-legged frog per mandated conservation efforts documented by SCHOOL DISTRICT.

3.4 EXISTING UTILITIES

A. SCHOOL DISTRICT will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by subcontractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. SCHOOL DISTRICT will arrange to shut off indicated utilities when requested by subcontractor.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by SCHOOL DISTRICT or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify SCHOOL DISTRICT not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without SCHOOL DISTRICT's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots, obstructions, and debris to a depth of 24 inches below exposed subgrade.
2. Use only hand methods for grubbing within protection zones.
3. Chip removed tree branches and dispose of off-site or per SCHOOL DISTRICT recommendation.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground, according to geotechnical recommendations.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 8 inches (200 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off SCHOOL DISTRICT's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 00
EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.
8. Excavating well hole to accommodate elevator-cylinder assembly.

B. Related Sections:
1. Section 321313 "Concrete Paving" .
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."

B. Quantity allowances for earth moving are included in Section 012100 "Allowances."

1.4 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by SCHOOL DISTRICT. Authorized additional excavation and replacement material will be paid for according to Subcontract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by SCHOOL DISTRICT. Unauthorized excavation, as well as remedial work directed by SCHOOL DISTRICT, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by a geotechnical testing agency, according to ASTM D 1586.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches (300 by 300 mm).
2. Warning Tape: 12 inches (300 mm) long; of each color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from SCHOOL DISTRICT and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by SCHOOL DISTRICT or authorities having jurisdiction.

B. Improvements on Adjacent Property: Authority for performing earth moving indicated on property adjacent SCHOOL DISTRICT's property will be obtained by SCHOOL DISTRICT before award of Subcontract.

1. Do not proceed with work on adjacent property until directed by SCHOOL DISTRICT.

C. Utility Locator Service: Notify SCHOOL DISTRICT for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 015000 "Temporary Facilities and Controls," Section 311000 and "Site Clearing," are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Materials shall be free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter per current geotechnical report.

1. Plasticity Index: R value greater than 40, P.I. 12 or less.

C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

I. Sand: ASTM C 33; fine aggregate.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Subcontract Sum or the Subcontract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by SCHOOL DISTRICT. The Subcontract Sum will be adjusted for rock excavation according to unit prices included in the Subcontract Documents. Changes in the Subcontract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.
3. Refer to building pad grading recommendations per latest Geotechnical Report.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: As indicated on drawings.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

A. Notify SCHOOL DISTRICT when excavations have reached required subgrade.

B. If SCHOOL DISTRICT determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired or equivalent machine to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction**,** repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by SCHOOL DISTRICT, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Subcontract provisions for unit prices changes in the Work.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by SCHOOL DISTRICT.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by SCHOOL DISTRICT at no additional cost to SCHOOL DISTRICT.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away minimum 2 feet from edge of excavations for every 1 foot depth of excavation ratio (2:1). Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape backfill course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil then fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete".

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Place and compact initial backfill of subbase material, free of particles larger than **1** inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Install detectable warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use 12” of topsoil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent or as indicated on plans.

3.15 GRADING

A. Contractor shall review Geotechnical recommendations prepared by Geosphere Consultants, Inc., February 15, 2012.

B. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

C. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

D. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Contractor shall review Geotechnical recommendations prepared by Geosphere Consultants, Inc., February 15, 2012.

B. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

C. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile if required on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

D. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Contractor shall review Geotechnical recommendations prepared by Geosphere Consultants, Inc., February 15, 2012.

B. Place drainage course on subgrades free of mud, frost, snow, or ice.

C. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

A. Special Inspections: SCHOOL DISTRICT will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: SCHOOL DISTRICT will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Geotechnical Engineer to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by SCHOOL DISTRICT.

E. Geotechnical Engineer will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and/or ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by SCHOOL DISTRICT; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off SCHOOL DISTRICT's property.

B. Transport surplus satisfactory soil to designated storage areas on SCHOOL DISTRICT's property. Stockpile or spread soil as directed by SCHOOL DISTRICT.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off SCHOOL DISTRICT's property.

END OF SECTION 31 20 00

SECTION 31 23 00
TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.1 SUMMARY

A. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.

1.2 SYSTEM DESCRIPTION

A. Quality Assurance:

1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

2. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

3. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the construction soil engineer.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 3” in greatest dimension, and with not more than 10% of the rocks or lumps larger than 1” in their greatest dimension.

2. Fill material is subject to the approval of the construction soil engineer, and is that material removed from excavations or imported from offsite borrow areas, predominantly granular, non-expansive soil free from roots and other deleterious matter.

3. Imported fill material shall, in addition, have 10 to 40% by weight passing the #200 sieve, a plasticity index of less than 15, and a liquid limit of less than 30%.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with documents and existing elevations.

3.3 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Architect.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. De-watering:

1. Remove all water, including rainwater; encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.

2. Keep trenches and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.4 TRENCHING

A. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.

1. Prior to backfilling, remove all sheeting.

2. Do not permit sheeting to remain in the trenches except when, in the opinion of the Architect, field conditions or the type of sheeting or methods of construction such as use of concrete bedding are such as to make removal of sheeting impracticable. In such cases, the Architect may permit portions of sheeting to be cut off and remain in the trench.

B. Open cut:

1. Excavate for utilities by open cut.

2. If conditions at the site prevent such open cut, and if approved by the Architect, trenching may be used.

3. Short sections of a trench may be tunneled if, in the opinion of the Architect, the conductor can be installed safely and backfill can be compacted properly into such tunnel.

4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the construction soil engineer.

5. When the void is below the subgrade for the utility bedding, use approved earth materials and compact to the relative density directed by the construction soil engineer, but in no case to a relative density less than 90%.

6. When the void is the side of the utility trench or open cut, use approved earth or sand compacted as approved by the construction soil engineer, but in no case to a relative density less than 85%.

7. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.

8. Excavating for appurtenances:

   a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.

   b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the construction soil engineer, and at no additional cost to the Owner.

C. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

D. Depressions:

1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.

2. Except where rock is encountered, do not excavate below the depth indicated or specified.

3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified.

E. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, over, and other requirements as sedt forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.

F. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

G. Cover:

1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade:

   a. Areas subject to vehicular traffic:

      (1) Sanitary sewers: 24";

      (2) Storm drains: 24".

b. Areas not subject to vehicular traffic:

(1) Sanitary sewers: 18";

(2) Storm drains: 18".

c. All areas:

(1) Water lines: 18";

(2) Natural gas lines: 18";

(3) Electrical cables: 24";

(4) Electrical ducts: 18".

d. Concrete encased:

(1) Pipe sleeves for water and gas lines: 18";

(2) Sanitary sewers and storm drains: 12";

(3) Electrical ducts: 18".

2. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long radius rigid metal conduit rise, provided it will not interfere with the structural integrity of the slab or pavement.

3. Where the minimum cover is not provided, encase the pipes in concrete as indicated. Provide concrete with a minimum 28-day compressive strength of 2500 psi.

3.5 BEDDING

A. Provide bedding as indicated in the Drawings.

3.6 BACKFILLING

A. General:

1. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.

2. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the construction soil engineer.

3. Reopen trenches that have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the construction soil engineer.

4. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests, and approvals.

5. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

B. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 12" maximum thickness, and compact with suitable tampers to 90% relative density (85% in landscape areas), until there is a cover of not less than 24" over sewers and 12" over other utility lines.

2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Remainder of trench:

1. Except for special materials for pavements, backfill the remainder of the trench with approved backfill.

2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density indicated by the construction soil engineer.

D. Adjacent to buildings: Mechanically compact backfill within ten feet of buildings.

E. Consolidation of backfill by jetting with water may be permitted, when specifically approved by the construction soil engineer, in areas other than building and pavement areas.

3.7 TEST FOR DISPLACEMENT OF SEWERS AND STORM DRAINS

A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.

B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.

C. If the illuminated interior of the pipeline shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the Owner.

3.8 PIPE JACKING

A. The Contractor may, at his option, install steel pipe casings, tongue and groove reinforced concrete pipes, and steel pipes under existing roads or pavements by jacking into place using procedures approved by the governmental agencies having jurisdiction and approved by the construction soil engineer.

3.9 TUNNELING OPERATIONS

A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the construction soil engineer and the governmental agencies having jurisdiction.

3.10 FIELD QUALITY CONTROL

A. The construction soil engineer will instruct open cuts and trenches before installation of utilities, and will make the following tests:

1. Assure that trenches are not backfilled until all tests have been completed;

2. Check backfilling for proper layer thickness and compaction;

3. Verify that test results conform to the specified requirements, and that sufficient tests are performed;

4. Assure that defective work is removed and properly replaced.

END OF SECTION 31 23 00

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

A. The following documents form a part of these specifications to the extent stated herein.

B. State of California, Department of Transportation (CALTRANS)

CALTRANS Standard Specifications:

- Sec 26. Aggregate Bases
- Sec 37. Bituminous Seals
- Sec 39. Asphalt Concrete
- Sec 88 Geosynthetics
- Sec 92. Asphalts
- Sec 93. Liquid Asphalts
- Sec 94. Asphaltic Emulsions

1.3 SUMMARY

A. Section Includes:

1. Cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt overlay.
5. Asphalt curbs.
6. Asphalt traffic-calming devices.
7. Asphalt surface treatments.

B. Related Requirements:

1. Section 312000 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.4 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Conduct conference if required by SCHOOL DISTRICT.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
3. Job-Mix Designs: For each job mix proposed for the Work.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Certificates: For each paving material.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Perform work in accordance with the State of California, Department of Transportation (CALTRANS) Standard Specifications, Sec 26, 37, 39, 88 92, 93, and 94.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of State of California, Department of Transportation (CALTRANS) Standard Specifications for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Slurry Seal: Comply with CALTRANS Standard Specification Section 37-3.03D(4)(a)(iii);
3. Asphalt Base Course: Minimum surface temperature of 50 deg F (10 deg C) and rising at time of placement.

4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

General: Use materials and gradations that comply with CALTRANS Standard Specification Section 39-1.02E: Aggregate:

1. 1/2-inch maximum HMA, Type A for asphalt concrete overlay

2.2 ASPHALT MATERIALS

A. Asphalt Binder: Comply with CALTRANS Standard Specification Section 39-1.02C Hot Mix Asphalt PG 64-10.

B. Tack Coat: Comply with CALTRANS Standard Specification Section 39-1.02B, Hot Mix Asphalt, grade SS1h asphaltic emulsion.

C. Fog Seal: Comply with CALTRANS Standard Specification Section 37-2.02D; Bituminous Seals, grade SS1h asphaltic emulsion.

D. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Reclaimed Asphalt Pavement: Comply with CALTRANS Standard Specification Section 39-1.02F.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

C. Sand: Comply with CALTRANS Standard Specification Section 39-1.02E.

D. Geotechnical Subsurface Reinforcement: Comply with CALTRANS Standard Specification Section 88-102D

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes complying with CALTRANS sec 39-1.03 and complying with the following requirements:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 2 inches (50 mm).
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Handle milled asphalt material according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."
8. Keep milled pavement surface free of loose material and dust.
9. Do not allow milled materials to accumulate on-site unless requested by SCHOOL DISTRICT.

3.3 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 gal./sq. yd. (0.2 L/sq. m).

1. Allow tack coat to cure per manufacturers requirements, undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/2 inch (12 mm) wide. Fill flush with surface of existing pavement and remove excess.
4. Refer to "3.3 Patching" for cracks greater than ½ inch.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.15 gal./sq. yd. (0.6 L/sq. m).

1. Allow tack coat to cure per manufacturers requirements undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 GEOSYNTHETIC PAVEMENT INSTALLATION

A. Comply with CALTRANS Standard Specification Section 39-1.09.

B. Apply asphalt binder uniformly to existing pavement surfaces at a rate of 0.25 gal./sq. yd. (to 1.0 L/sq. m).

C. Place paving geosynthetic promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).

D. Protect paving geosynthetic from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.7 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent or greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 12-foot (3.6-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.11 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry seals according to CALTRANS Standard Specification Section 37-3.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: SCHOOL DISTRICT will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. FLOOD TEST

A. Prior to application of seal coat, perform a flood test in the presence of SCHOOL DISTRICT.

Method:

1. Flood the entire asphaltic concrete paved area with water by use of a tank truck or hoses.

2. If a depression is found where water ponds to a depth of more than 1/8" in six feet, fill or otherwise correct to provide proper drainage.

3. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

3.13 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 32 12 16

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

A. The following documents form a part of these specifications to the extent stated herein.

B. State of California, Department of Transportation (CALTRANS)

1. CALTRANS Standard Specifications:
   Sec 37 Bituminous Seals
   Sec 90 Concrete

1.3 SUMMARY

A. Section Includes:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

B. Related Sections:

1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

D. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

E. Color:

1. Light colored concrete can reduce heat island effect in urban areas. Specify concrete with an emissivity of .9 when tested for ASTM 408 and an initial reflectance of at least .25 when tested for ASTM E903.

1.6 INFORMATIONAL SUBMITTALS

A. Perform submittals in accordance with CALTRANS Sec 90-1.01C

1.7 QUALITY CONTROL and ASSURANCE

A. Perform Quality Control and Assurance in accordance with CALTRANS Sec 90-1.01D

B. Retain subparagraph below, which is required by ACI 301 and ASTM C 31. ASTM C 1077 notes that relevant field or laboratory technician certification by ACI, NRMCA, PCA, or the National Institute for Certification in Engineering Technologies may demonstrate evidence of competence.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

D. ACI Publications: Comply with ACI 301 unless otherwise indicated.

1.8 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities based on the California Manual of Uniform Traffic Control Devices (CA MUTCD).

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F (12.8 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615, Grade 60 (Grade 420); deformed.

C. Galvanized Reinforcing Bars: ASTM A 767, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615, Grade 60 (Grade 420) deformed bars.

D. Epoxy-Coated Reinforcing Bars: ASTM A 775 or ASTM A 934; with ASTM A 615, Grade 60 (Grade 420) deformed bars.

E. Steel Bar Mats: ASTM A 184; with ASTM A 615, Grade 60 (Grade 420), deformed bars; assembled with clips.

F. Joint Dowel Bars: ASTM A 615, Grade 60 (Grade 420) plain-steel bars **;** zinc coated (galvanized) after fabrication according to ASTM A 767, Class I coating. Cut bars true to length with ends square and free of burrs.

G. Epoxy-Coated, Joint Dowel Bars: ASTM A 775; with ASTM A 615, Grade 60 (Grade 420), plain-steel bars.

H. Tie Bars: ASTM A 615, Grade 60 (Grade 420), deformed.

I. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

J. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

K. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

L. Zinc Repair Material: ASTM A 780.

2.3 CONCRETE MATERIALS

A. Perform in accordance with CALTRANS Sec 90-1.02 MATERIALS

1. Sec 90-1.02A General
2. Sec 90-1.02B Cementitious Materials
3. Sec 90-1.02C Aggregates
4. Sec 90-1.02D Water
5. Sec 90-1.02E Admixtures
6. Sec 90-1.02F Proportioning Concrete
7. Sec 90-1.02G Mixing and Transporting Concrete
8. Sec 90-1.02H Concrete in Corrosive Environments
9. Sec 90-1.02I Concrete in Freeze-Thaw Areas
10. Sec 90-1.02J Curing Compound

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: Match SCHOOL DISTRICT's sample per architect’s drawings.

2.4 CURING MATERIALS

A. Perform in accordance with CALTRANS Sec 90-1.03 CONSTRUCTION
1. Sec 90-1.03A General
2. Sec 90-1.03B Curing Concrete
3. Sec 90-1.03C Protecting Concrete

2.5 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm). Use only when approved by SCHOOL DISTRICT.

F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement. Use only when approved by SCHOOL DISTRICT.

1. Color: Match SCHOOL DISTRICT's sample.

G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch (9.5-mm) sieve and 85 percent retained on a No. 8 (2.36-mm) sieve.

2.6 DETECTABLE WARNING MATERIALS

A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advanced Surfaces Inc.
b. Superior Decorative by Dayton Superior.
c. Or equal

2. Size of Stamp: One piece matching detectable warning area shown on Drawings.

B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Advanced Surfaces Inc.; Liquid Release.
b. Superior Decorative by Dayton Superior; Pro Liquid Release.
c. Or equal

2.7 PAVEMENT MARKINGS

A. Refer to Specification 321723 “PAVEMENT MARKINGS AND SIGNS”

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content according to ASTM C260:

D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with SCHOOL DISTRICT approval.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

3. Doweled contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation**,** and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

H. Screed paving surface with a straightedge and strike off.

I. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

J. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Subcontractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms**,** steel reinforcement**,** and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.8 DETECTABLE WARNINGS

A. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.

1. Before using stamp mats, verify that the vent holes are unobstructed.
2. Apply liquid release agent to the concrete surface and the stamp mat.
3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash

surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screening, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm) and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/2 inch (13 mm).

4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with SCHOOL DISTRICT.

B. Allow concrete paving to cure for a minimum of 28 days and be dry before starting pavement marking or as instructed by SCHOOL DISTRICT.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.12 WHEEL STOPS

A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.

B. Securely attach wheel stops to paving with not less than two steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: SCHOOL DISTRICT will engage a qualified testing agency to perform tests and inspections.

B. Test results shall be reported in writing to SCHOOL DISTRICT, concrete manufacturer, and Subcontractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work,

design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by SCHOOL DISTRICT but will not be used as sole basis for approval or rejection of concrete.

D. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by SCHOOL DISTRICT.

E. Concrete paving will be considered defective if it does not pass tests and inspections.

F. Additional testing and inspecting, at Subcontractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.14 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by SCHOOL DISTRICT.

B. Drill test cores, where directed by SCHOOL DISTRICT, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 18 16

PLAYGROUND SAFETY SURFACING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Poured-in-place surfacing

B. Playground surfacing system: Extreme-10 with a 10 year warranty.

1.2 DESCRIPTION

A. Work included: Furnish all items including but not limited to all labor, materials, equipment, rentals, facilities, transportation, incidentals, excavations, footings, and services to complete all Synthetic Resilient Surfacing and related work as shown on the drawings and/or specified herein and as necessary for a complete installation.

1.3 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

A. American Society for Testing and Materials (ASTM)

1. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
2. ASTM C 136 (1984a; R 1993) Sieve Analysis of Fine and Coarse Aggregates
3. ASTM D 1682 (1964; R 1975) Breaking Load and Elongation of Textile Fabrics
4. ASTM D 2240 (1991; R 1993) Rubber Property—Durometer Hardness
5. ASTM D 3776 (1985; R 1990) Mass per Unit Area (Weight) of Woven Fabric
6. ASTM D 4491 (1989; R 1992) Water Permeability of Textiles by Permeability
7. ASTM D 4533 (1985; R 1991) Trapezoid Tearing Strength of Geotextiles
8. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
9. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
10. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
11. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
12. ASTM D 4632 (1991) Grab Breaking Load and Elongation of Geotextiles
13. ASTM D 5199 (1991; R 1992) Measuring Nominal Thickness of Geotextiles and Geomembranes
14. ASTM F 1292 (1995) Impact Attenuation of Surface Systems Under and Around Playground Equipment
15. ASTM F 1487 (1995) Playground Equipment for Public Use

16. ASTM F 1951 Standard Specification for Determination of Accessibility of Surface Systems

B. Code of Federal Regulations (CFR) CFR 28 Part 36 (1991) Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule

C. U.S. Consumer Product Safety Commission (CPSC) PSC (1991) Handbook for Public Playground Safety or current edition, U.S. Consumer Product Safety Commission, Washington, D.C. 20207, 301-504-0494

1.4 SYSTEM DESCRIPTION

A. Performance Requirements: Provide a 2 layer rubber-urethane playground surfacing system which has been designed, manufactured and installed to meet the following criteria:

1. Shock Attenuation (ASTM F1292):
   a. Gmax: Less than 200.
   b. Head Injury Criteria: Less than 1000.
2. Flammability (ASTM D2859): Pass.
3. Tensile Strength (ASTM D412): 60 psi (413 kPa).
4. Tear Resistance (ASTM D624): 140%.
5. Water Permeability: 0.4 gal/yd2/second.
6. Accessibility: Comply with requirements of ASTM F1951.

1.5 PERFORMANCE REQUIREMENTS

A. Installer Qualifications: Engage an experienced installer or applicator who has specialized for a minimum of 10 years in installing the specific site furnishings required for this Project and who is acceptable to Manufacturer of primary materials. Installer must provide a minimum of 3 documented and inspectable installations within 100 mile radius of the subject project at least 5 years old with project names, dates, and owner contracts provided with the submittal. The Contractor shall furnish a list of projects using either specified material or equivalent that they have installed during the last three years. Information shall include project name, square footage, owner contact name with owner's address and phone number. Also, the contractor shall furnish resumes detailing the experience of key personnel, including supervisors and mechanics. The Contractor shall be approved in writing by the material manufacturer for the system being installed.

B. Assign a full-time employee to the job as supervisor for the duration of the Contract with a minimum of four (4) years experience in synthetic play surfacing installation.

C. Labor Force: Provide installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner, acceptable to the Owner.

D. Manufacturer's Services

1. Services of a manufacturer's representative, or manufacturer's certified or authorized installer, who is experienced in installation of the specified playground safety surface, shall be provided. The representative shall supervise or inspect the installation to ensure that the safety surfacing meets the impact attenuation requirements as specified herein.

2. The manufacturer’s representative shall certify that, regardless of the installer, the installation complies with the manufacturer's instructions and specifications, as specified in paragraph 1.4.6.

1.6 REGULATORY REQUIREMENTS

A. Conform to all federal, state, Owner, local codes and requirements for installation and disabled accessibility as referenced herein and as applicable.

1.7 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer’s product data and installation instructions.

C. Verification Samples: Submit manufacturer’s standard verification samples of 9" x 9" (229 x 229 mm) minimum.

D. Quality Assurance/Control Submittals: Submit the following:

1. Certificate of qualifications of the playground surfacing installer.

2. Manufacturer recommended cleaning and maintenance instructions.

E. Submit shop drawings showing depth of the safety surfacing system, including depths of material, sub-base materials, hardware, edge details, and drainage.

F. Submit a list of materials and components to be installed as part of the system, by weight and/or volume and recommended coverage, including manufacturer's name, shipment date, storage requirements, and precautions, and that shall state chemical composition and test results to which material has been subjected in compliance with these Specifications.

G. Proposed substitutions for specified products shall not be accepted.

H. An official authorized to certify on behalf of the synthetic safety surfacing manufacturer shall sign a statement attesting that the surfacing meets the requirements of ASTM F 1292 for a head-first fall from the highest accessible portion of installed play equipment. The impact attenuating qualities of the surfacing system shall not be diminished in the surface areas covering hardware. Testing of product shall include tests conducted over hardware. The statement shall be dated after the award of the Contract, shall state the Contractor's name and address, and shall name the project and location. The statement shall also provide the name, address, and telephone number of the testing company, the date of the test, and the test results.

I. The authorized manufacturer’s representative shall certify upon completion of the installation that the safety surfacing has been installed in accordance with manufacturer’s instructions and complies with all specifications.

J. A Certificate of Insurance shall be provided by manufacturer of safety surfacing, covering both product and general liability, of not less than $5,000,000. The issuing underwriter shall be AA rated.

K. Submit a sample of each type of synthetic safety surfacing, minimum size 150 mm by 150 mm (9" by 9"), of the color(s) specified, proposed for this Project.

1.8 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of products specified in the Section with a minimum of ten years documented experience.

B. Installer: Company specializing in applying the work of the Section with minimum ten years documented experience, approved by manufacturer.

C. International Play Equipment Manufacturers Association (IPEMA) certified.

1.9 MAINTENANCE DATA

A. Submit maintenance data under provisions and as follows:

1. Prepare and deliver to the Owner, ten (10) days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two (2) individually bound copies of the operation and maintenance manual.

The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand and maintain installation. Each complete, 3-ring binder manual shall include the following information:

a. Index sheet stating Contractor's address and telephone number.

b. Duration of guarantee period.

c. List of components with names and addresses of local manufacturer's representative.

d. Complete maintenance instructions.

B. Include maintenance information on regular cleaning, damage and stain removal.

1.10 WARRANTY

A. Safety surfacing shall maintain required impact attenuation characteristics and be guaranteed against defects in workmanship or materials for the following time periods dating from final acceptance by the Owner, a minimum of ten years.

B. Project Warranty: Refer to Conditions of the Manufacturer's Contract for project warranty provisions.

C. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

D. Proper drainage is critical to the longevity of the Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. Safety: Safety surfacing within playground equipment use zones shall meet or exceed the performance requirements of CPSC and ASTM F 1292 that a surface yield both a peak deceleration of no more than 200g, and a Head Injury Criteria (HIC) value of no more than 1,000 g, for a head-first fall from the highest accessible portion of play equipment being installed. The highest accessible portion of playground equipment shall be as specified in Section 11 68 16 - Playground Equipment. The contractor is responsible for obtaining a determination from the safety surfacing manufacturer of the product depth required to meet performance requirements for all play equipment.

1. The impact attenuation performance of the synthetic safety surfacing proposed for installation shall be documented by certificates of compliance, as specified in paragraphs 1.3 submittals, F and G.

2. Accessibility: Safety surfaces intended to serve as accessible paths of travel for persons with disabilities shall be firm, stable and slip resistant and shall meet the requirements of FEDSTD 795, 28 CFR Part 36 ASTM F 1487, 1292, 1951.

2.2 POURED-IN-PLACE PLAYGROUND SURFACING SYSTEM

Synthetic surfacing shall be a poured-in-place system, consisting of an impact attenuating substrate and a wear surface bonded to produce a uniform material. Surfacing shall be per plan.

A. Manufacturer: Surface America, Inc. or approved equal

1. Contact: PO Box 157, Williamsville, NY 14231; Telephone: (800) 999-0555, (716) 632-8413; Fax: (716) 632-8324; E-mail: info@surfaceamerica.com; website: http://www.surfaceamerica.com.

B. Proprietary Products/Systems. Poured-in-place playground surfacing system, including the following:

1. PlayBound Poured-In-Place Primer:
   a. Material: Urethane.

2. PlayBound Poured-in-Place Basemat:
   a. Material: Blend of 100% recycled SBR (styrene butadiene rubber) and urethane.
   b. Thickness: Per plans.
   c. Formulation Components: Blend of strand and granular material.

3. PlayBound Poured-In-Place Top Surface:
   a. Material: Blend of recycled EPDM (ethylene propylene diene monomer) rubber and aromatic or aliphatic urethane binder.
   b. Thickness: Nominal 1/2" (12.7 mm), minimum 3/8" (9.5 mm), maximum 5/8" (15.9 mm).
   c. Color: Per plans.
   d. Binder: Aliphatic Urethane (Extreme-10).
   e. Dry Static Coefficient of Friction (ASTM D2047): 1.0.
   f. Wet Static Coefficient of Friction (ASTM D2047): 0.9.
   g. Dry Skid Resistance (ASTM E303): 89.
   h. Wet Skid Resistance (ASTM E303): 57.

2.3 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

2.4 MIXES

A. Required mix proportions by weight:

1. Basemat: 16+% urethane (as ratio: 14% urethane divided by 86% rubber). 14% urethane, 86% rubber (based on entire rubber & urethane mix).

2. Top Surface: 22% urethane (ratio: 18% urethane divided by 82% rubber). 18% urethane, 82% rubber (based on entire rubber & urethane mix).

PART 3 - EXECUTION

3.1 GENERAL

A. SITE CONDITIONS

1. Synthetic safety surfacing shall be installed on dry subsurfaces. Temperatures and weather conditions shall be as recommended by the manufacturer, with no prospect of rain within the initial drying period.

B. SEQUENCING AND SCHEDULING

1. Safety surfacing shall be installed after the playground equipment is installed. The installation shall be coordinated with playground equipment and site element installation.

3.2 PREPARATION

A. Subsurface

1. The appropriate subgrade elevation shall be as established for the particular safety surfacing to be installed. The subsurface shall be installed in a true, even plane, and sloped to drain. Subsurface irregularities shall be corrected. Subsurface: Tolerance of concrete or bituminous subsurface shall be within 1/8 inch (3.0 mm) in 10 feet (3050 mm).

B. Drainage

1. The Contractor shall verify that subsurface drainage, including piped drainage systems, if required, has been installed to provide positive drainage.

3.3 COORDINATION

A. Coordinate with work of other sections to insure appropriate sequencing of events.

3.4 SYNTHETIC POUR-IN-PLACE SURFACING INSTALLATION

Preparation and installation shall be in accordance with manufacturer’s specifications and directions.

A. Poured-in-Place System: Components of the poured-in-place safety surface system shall be mixed mechanically on site in accordance with manufacturer's recommendations to ensure a uniform distribution of binder. Hand-mixing shall not be allowed. Installation of poured-in-place surfacing shall be seamless and completely bonded to subsurface. Material shall cover all foundations and fill around all elements penetrating the surface. Manufacturer’s Services: For safety surfacing, service of the manufacturer’s representative who is experienced in installation of playground safety surface shall be provided. The representative shall supervise the installation to ensure that the safety surfacing meets the impact attenuation requirements as specified herein.

1. Thickness:

a. Construction methods, such as use of measured screeds 1 mm (1/16") thicker than the required surfacing depth, shall be employed to ensure full depth of specified surfacing material is installed.

b. Surfacing system thickness throughout the playground equipment use zone shall be as required to meet the impact attenuation requirements for a head-first fall from the highest accessible portion of installed play equipment.

c. Critical Fall Height of Play Area based on highest accessible part of the equipment. See website by Surface America for Poured-in-Place thickness and critical fall heights: http://www.SurfaceAmerica.com

Critical Fall Height	Thickness of Surfacing
6’	3.0” min.

B. UV Protective Sealer: Apply per manufacturer’s recommendations.

C. Clean-up: Do not allow adhesives on adjacent surfaces. Immediately clean up spills or excess adhesive.

D. Protection: The synthetic safety surfacing shall be allowed to fully cure in accordance with manufacturer's instructions. The surface shall be protected from all traffic during the curing period for forty-eight (48) hours or as instructed by the manufacturer. Protect from damage at all times, until final acceptance of the Work. If damage occurs to any safety surfacing prior to final acceptance, Contractor shall, at his own expense, make repair or replacement to satisfaction of the Owner.

3.5 MANUFACTURER’S INSTRUCTIONS

A. Comply with the instructions and recommendations of the playground surfacing manufacturer.

3.6 EXAMINATION

A. Substrate preparation must be in accordance with surfacing manufacturer’s specification. New concrete must be fully cured – up to 7 days.

B. Proper drainage is critical to the longevity of the PlayBound Poured-in-Place surfacing system. Inadequate drainage will cause premature breakdown of the poured system in affected areas; and void the warranty.

3.7 PREPARATION

A. Surface Preparation: Using a brush or short nap roller, apply primer to the substrate perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

3.8 INSTALLATION

A. Do not proceed with playground surfacing installation until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work, has been completed.

B. Basemat Installation:

1. Using screeds and hand trowels, install the basemat at a consistent density of 29 pounds, 1 ounce per cubic foot (466 kg/m3) to the specified thickness.

2. Allow basemat to cure for sufficient time so that indentations are not left in the basemat from applicator foot traffic or equipment.

3. Do not allow foot traffic or use of the basemat surface until it is sufficiently cured.

C. Primer Application: Using a brush or short nap roller, apply primer to the basemat perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

D. Top Surface Installation:

1. Using a hand trowel, install top surface at a consistent density of 58 pounds, 9 ounces per cubic foot (938 kg/m3) to a nominal thickness of 1/2" (12.7 mm).

2. Allow top surface to cure for a minimum of 48 hours.

3. At the end of the minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface.

4. Do not allow foot traffic or use of the surface until it is sufficiently cured.

3.9 DELIVERY, STORAGE, AND HANDLING

A. Materials and equipment shall be delivered in manufacturer’s original, unopened, undamaged containers with identification labels in tact and stored, if necessary, in accordance with the manufacturer's recommendations, in an area as directed by the Owner.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 degrees F (4 degrees C) and a maximum temperature of 90 degrees F (32 degrees C).

3.10 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Install surfacing system when minimum ambient temperature is 40 degrees F (1 degree C) and maximum ambient temperature is 90 degrees F (32 degrees C). Do not install in steady or heavy rain.

3.11 CLEANING

A. Prior to final acceptance clean safety surface in accordance with manufacturer’s directions.

END OF SECTION

SECTION 32 84 00
IRRIGATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Work Included: Irrigation system shall include all work, labor and materials related to irrigation including but not limited to all trenching, piping, valves, materials, bubblers, spray heads, wiring, trenching, rentals, incidentals, repairs, warranties, modifications, temporary systems, guarantee and maintenance for the complete and functional installation of all Irrigation Systems at the existing fields, on grade.

1.2 RELATED SECTIONS

A. Section 32 90 00 – PLANTING

B. Section 32 01 90 – LANDSCAPE MAINTENANCE

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D 1784: Standard specification for rigid poly (vinyl chloride) (PVC) compounds and chlorinated poly (vinyl chloride) (CPVC) compounds.

2. ASTM D 1785: Standard specification for poly (vinyl chloride) (PVC) plastic pipe, schedules 40, 80, and 120, and class 200 and 315.

3. ASTM D 2241: Standard specification for poly (vinyl chloride) (PVC) plastic pipe.

4. ASTM D 2464: Threaded poly (vinyl chloride) (PVC) plastic pipe fittings, schedule 80.

5. ASTM D 2466: Standard specification for poly (vinyl chloride) (PVC) plastic pipe fittings, schedule 40.

6. ASTM D 2467: Standard specification for socket-type poly (vinyl chloride) (PVC) plastic pipe fittings, schedule 80.

7. ASTM D 2564: Standard specification for solvent cements.

8. ASTM 2672: Standard specification for bell-end poly (vinyl chloride) (PVC) plastic pipe.

B. National Sanitation Foundation (NSF).

C. American Water Works Association (AWWA)

D. PVC pipe, AWWA Manual M23. AWWA, Denver, Colorado. (1980).

1. Uniform Plumbing Code (UPC), latest edition

2. National Electric Code (NEC), latest edition

3. American National Standards Institute (ANSI)

4. Safety and Health Regulations for Construction, Department of Labor

1.4 PERFORMANCE REQUIREMENTS

A. Labor Force: Provide installation and maintenance force thoroughly familiar with, and trained in, the work to be accomplished to perform the task in a competent, efficient manner, acceptable to the District.

C. Do not install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies exist that might not have been considered in engineering the system. Bring such obstructions or differences to the attention of the Architect. In the event this notification is not given, the Contractor shall assume full responsibility for any revision necessary.

1.5 REGULATORY REQUIREMENTS

A. Conform to all federal, state, district, local codes and requirements for installation as referenced herein and as applicable.

1.6 SUBMITTALS

A. Submit product data under provisions of section 01 33 00 and as follows:

B. Submit to the Architect, within five (5) calendar days after the date of commencement specified in the notice to proceed and prior to performing any work, three (3) typewritten lists containing a description of all proposed irrigation material to be used. Submittal shall also include proposed substitute material. Include manufacturer's name and local representative, catalogue data, samples, warranties, and full descriptive/technical literature for all material specified on the Drawings or in the Specifications.

C. Material substitution will not be permitted without prior written approval of the District Contact or designated representative.

D. Material list shall be submitted using the following layout:

Item No. Description Manufacturer Model No.

1.	Lateral supply lines	XXXX	Sch. 40
2.	Lawn head	Toro	570Z
3.	Etc.	Etc.	Etc.

E. Equipment or material installed or furnished without the prior written approval of the Architect or designated representative may be rejected and such materials removed from the site at no expense to the District.

F. Approval of any items, alternates, or substitutes indicates only that the product(s) apparently meet the requirements of the Drawings and Specifications on the basis of the information or samples submitted.

G. Manufacturer's warranties shall not relieve liability under the guarantee. Such warranties shall only supplement the guarantee.

1.7 QUALITY ASSURANCE

A. Manufacturer: Company(ies) specializing in the manufacture of products specified in the Section with a minimum of five years documented experience.

B. Installer: Company specializing in applying the work of the Section with minimum five years documented experience in installation of irrigation systems.

1.8 MAINTENANCE DATA

A. Submit maintenance data under provisions specified herein and as follows:

1. Prepare and deliver to the District, ten (10) days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two (2) individually bound copies of the operation and maintenance manual.
2. The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, 3-ring binder manual shall include the following information:

a. Index sheet stating Contractor's address and telephone number.

b. Duration of guarantee period.

c. List of equipment with names and addresses of local manufacturer representatives.

d. Complete operating and maintenance instructions on all major equipment. Include exploded parts drawing and parts list where available from manufacturer.

e. In addition to the above maintenance manuals, provide the District with instructions for major equipment and show written evidence

to the District at the conclusion of the project that this service has been rendered.

B. Include maintenance information on regular maintenance, adjustment and testing.

1.9 WARRANTIES AND REPLACEMENT

A. Provide written guarantee, on Contractor's letterhead of the following:

Irrigation material and installation: Warrant that the installed irrigation system will be free from defects, malfunction and failure due to faulty workmanship or defective material or equipment, and comply with these Specifications, for a period of one (1) year from date of final acceptance by the District.

B. Replacements: Replace irrigation materials or components that are identified, within one year, as being inadequate, not as specified or accepted substitution, with the specified material or component. Replacement to comply with all requirements of this Specification. Upon being informed by the District of any defects or malfunctions, the Contractor shall affect all necessary repairs and/or replacements according to Specifications in a reasonably expedient manner at no additional cost to the District. If the Contractor does not respond to the District's request for repair work within a period of three (3) working days, the District may proceed with necessary repairs and charge the Contractor for all expense incurred in the repair work.

The District may make emergency repairs, when necessary, without relieving the Contractor of his or her guarantee obligation. The Contractor is also obligated to restore any and all damaged plantings, paving, or other improvements where damage was a result of the improper operation of the system or where damage occurred during repair procedures.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and protect products as specified below.

B. Materials Delivery and Storage: Protect work and materials from damage during construction and store as directed by the District. Deliver manufactured materials in original containers with brand and maker's name marked thereon. Materials in broken containers or showing evidence of damage will be rejected and must be immediately removed from the site. Deliver quantities necessary to complete the work shown on the Drawings. Any discrepancy in the quantities given on the plans shall not entitle Contractor to additional remuneration.

C. Handle plastic pipe carefully; especially protect it from prolonged exposure to sunlight.

1.11 GENERAL REQUIREMENTS

A. OSHA Compliance: All articles and services covered by this Specification shall meet or exceed the safety standards established under the Federal Occupational Safety and Health Act of 1970, together with all amendments in effect as of the date of this Specification.

B. Codes and Standards: Comply with all applicable codes and standards.

1. All work and materials to be in full accordance with the latest rules and regulations of the National Electric Code; the Uniform Plumbing Code, published by the Western Plumbing Officials Association; and other applicable State or Local laws or regulations. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes.

2. When the Specifications call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, the provision of the Specifications take precedence over the requirements of the said rules and regulations.

3. Furnish without any extra charge any additional material and labor when required by the compliance with these rules and regulations, though the work may not be mentioned in these particular Specifications or shown on the Drawings.

4. Erect and maintain barricades, guards, warning signs, and lights as necessary or required by OSHA regulations for the protection of the public or work crew.

5. Any existing building, utilities, equipment, piping, sewers, electrical, sidewalks, landscaping, etc., damaged during the course of this Contract work shall be replaced or repaired by the in a manner satisfactory to the District Representative at Contractor's own expense, and before the final payment is made. Be responsible for damage caused by leaks in the piping systems being installed or having been installed under this contract work. Repair, at no additional expense to the District, all damage so caused, in a manner satisfactory to the District.

6. Pay for all permits, licenses, and fees as required.

1.12 PROJECT SITE CONDITIONS

Site Visit: At beginning of work, visit and walk the site with the District's Representative to clarify scope of work and understand existing project site conditions. Identify location of utilities and other improvements. Notify Architect of conflicts prior to start of work for resolution.

1.13 LAYOUT OF WORK: Stake out the irrigation system as shown on the Drawings. These areas to be checked by the Architect before construction is started. Any changes, deletions, or additions to be determined at this check.

The drawings show, if applicable, existing and below grade structures and utilities which are known to the District. Locate known existing installations before proceeding with construction operations that may cause damage to such installations. Keep existing installation in service where possible and damage to them repaired with no adjustment to the Contract Sum. If other structures or utilities are encountered, request District's Representative to provide direction on how to proceed with the Work. If a structure or utility is damaged, take appropriate action to insure the safety of persons and property.

1.14 SEQUENCING AND SCHEDULING

A. Acceptance: Do not install main line trenching prior to acceptance by Architect of rough grades completed under another Section.

B. Coordination: Coordinate with the work of other sections to insure the following sequence of events:

1. Sleeves and Conduits: Installation of all sleeves and conduits to be located under paving and through walls prior to placement of those materials.

2. Bubbler Heads: Install after placement of tree, but prior to backfill with planter soil mix.

3. If required, coordinate work schedule with District to avoid disruption of landscape maintenance of existing landscaping.

1.15 INSTRUCTION

After the system has been installed and approved, instruct the District's maintenance representative in complete operation and maintenance of the irrigation system.

1.16 RECORD DRAWINGS

A. Maintain one (1) complete set of blueline or blackline prints of all irrigation contract drawings in the field office. The prints shall be in order and available for review at all times.

B. Record accurately on one (1) set of prints of the irrigation drawings, all changes in the work constituting departures from the original Contract Drawings, including changes in both pressure and non-pressure line.

C. Upon completion of each increment of work, transfer all such information and dimensions to the prints. The changes and dimensions shall be recorded in a legible and professional manner to the satisfaction of the District Representative. When the drawings are approved, transfer all information to a set of reproducible drawings supplied by the District.

D. Dimension from two (2) permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Locations shown on "as-built" record drawings shall be kept day-to-day as the project is being installed.

E. Show locations and depths of the following items:

1. Points of connection to water and electrical power
2. Routing of constant pressure lines (dimension maximum 30 m (100 feet) along routing).
3. Ball valves.
4. Sprinkler control valves.
5. Routing of lateral lines
6. Quick coupling valves (QCV).
7. Routing of low voltage wires.
8. Sleeve locations
9. Other related improvements and equipment (as may be directed by the District Representative or designated representative).

F. Make all changes to reproducible drawings in ink (no ballpoint pen). Use eradicating fluid when redoing drawings, in a manner equal to the original drawing.

G. Upon completion of "as-built" conditions to reproducible drawings, submit reproducible "as-built" record drawings to District for review and approval.

H. "As-built" record drawings must be completed and approved before release of job.

1.17 CONTROLLER CHARTS

A. The District must approve "As-built" record drawings before charts are prepared.

B. Provide controller chart showing the area covered by the controller. Provide the maximum size the controller door will allow.

C. The chart is to be an A4 (8-1/2" X 11") reduced drawing of the actual "as-built" system and shall include the items as stated in 1.10 Record drawings with the exception of the dimension lines.

D. Chart shall be blackline print and a different color used to show area of coverage for each station.

E. When the charts are completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum .5 mm (20 mil) thick.

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F. These charts must be completed and approved prior to final acceptance of the irrigation system.

1.18 CHECKLIST

A. The following checklist shall be completed at the end of the project, using the format shown:

1. Plumbing permits (if none are required, so note)
2. Material approvals (approved by and date)
3. Pressure line tests (by whom and date)
4. "As-built" record drawings completed (received by and date)
5. Controller charts completed (received by and date)
6. Materials furnished (received by and date)
7. Operation and maintenance manuals furnished (received by and date)
8. System equipment operation instructions (received by and date)
9. Manufacturer warranties, if required (received by and date)
10. Written guarantee (received by and date)

B. Signed and dated checklist must be forwarded to the District's designated representative before final acceptance of the project.

1.19 SUBSTITUTIONS

A. Substitutions shall be per Section 01 62 00 and as follows:

1. If proof is submitted to the Architect that any irrigation material or component specified is not obtainable, a proposal will be considered for use of nearest equivalent.
2. Substantiate and submit proof in writing to the Architect within 10 days after the effective date of Notice to Proceed.

PART 2 MATERIALS

2.1 PIPE AND FITTINGS

A. Main Lines (constant pressure): Polyvinylchloride (PVC) 1120-Schedule 40 with solvent weld socket connections. Pipe shall be as manufactured by PW Pipe, J-M Pipe, or equal.

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B. Lateral Lines (non-constant pressure): Polyvinylchloride (PVC) 1120-Class 200 plastic with solvent-weld socket connections as manufactured by PW Pipe, J-M Pipe, or equal.

C. Main Line Fittings: Schedule 40 or 80, Type I, Grade I PVC plastic solvent weld socket fittings as manufactured by Lasco, Spears, or equal. Connections between main lines and RCVs shall be of Schedule 80 PVC (threaded both ends) nipples and fittings including tee at main line.

D. Lateral Line Fittings: Schedule 40, Type I, Grade I, PVC plastic solvent weld socket fittings as manufactured by Lasco, Spears, or equal.

E. Plastic Pipe: Extruded from an improved PVC virgin pipe compound featuring high tensile strength, high chemical resistance, and high impact strength meeting the requirements of cell classification 12454 A or B for pipe. This compound must have *15 MPa (2000 PSI)* hydrostatic design stress rating.

Do not re-use existing PVC pipe.

F. Markings: All PVC plastic pipe must bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in kPa (PSI) and NSF (National Sanitation Foundation) with the date of extrusion on the pipe marked on the pipe.

G. Joints: Solvent cement joints for plastic pipe and fittings shall be made as prescribed by manufacturer. Cement shall be IPS Weld-On or equal.

H. Each pipe installer expected to make solvent joints to receive instruction in the proper assembly of such joints before starting a job.

I. All PVC plastic fittings to be injection molded of an improved PVC fitting compound featuring high tensile strength. In terms of the current ASTM Standard D 1784-69, the compound must meet the requirements described in cell classification 12454B. Where threads are required in plastic fitting, these shall be injection molded also. All tees and ells shall be side gated.

J. All PVC fittings to bear the company's name or trademark, material designation, size, applicable IPS schedule, and NSF seal of approval.

K. All threaded PVC nipples to be standard weight Schedule 80 with molded threads.

L. Connections between main lines and RCVs to be as shown in the Construction Details.

M. Risers to sprinklers and quick coupling valves shall be as shown in the Construction Details.

2.2 REMOTE CONTROL VALVES (RCV):

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A. Solenoid electric control valves shall be Irritrol 700 series.

B. Filters shall be Toro with 150 mesh screen.

2.3 BALL VALVE: Ball valves shall be as noted in the Drawings.

2.4 QUICK COUPLING VALVE AND KEY

A. Quick coupling valve (QCV) shall be by Hunter. The valve body to be of two-piece construction with a cover of bronze and thermoplastic rubber marked "DO NOT DRINK" in English and Spanish language.

B. Quick coupling valve key to be of the same manufacturer as the QCV.

2.5 VALVE BOXES

A. Boxes manufactured by Carson or equal.

B. Ball/Gate Valve, Quick Coupling Valve: 10" round deep green box. Lid shall be green, marked "IRRIGATION" and have a lock bolt. Carson 910, or approved equal.

C. Remote Control Valve Boxes and Splice Boxes: 11-3/4" X 17" X 12" deep green box. Lid shall be green, marked "IRRIGATION" and have a lock bolt. Carson 1419 or approved equal.

2.6 SPRINKLER HEADS: Sprinkler heads as listed in drawings.

2.7 WIRE

A. Low voltage wire to remote control valves shall be soft-annealed, uncoated copper, single conductor, with PVC insulating jacket and UL approval for direct burial in soil, AWG-UF (600 volt). The size and color of control wire as follows: pilot wire - No. 14 red; common wire - No. 12 white.

B. Install control wire without splices between controller and electric valve. Only where approved by the District Representative shall splices be made with 3M DBR/Y, no equal. Make all wire splices in a splice box with locking top, Carson or approved equal.

C. Label all valve boxes as shown in irrigation details.

D. Provide and install four (2) extra, continuous #14-1 conductors at the low voltage electrical points of connection to each installed valve box. Stub a 600 mm (24") excess loop into each box. These are extra wires, in addition to the control valve wires, and shall be yellow in color.

2.8 MISCELLANEOUS INSTALLATION MATERIALS

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A. Solvent cement and primer for solvent and joints to be make and type approved by manufacturer(s) of pipe and fittings. Maintain cement at proper consistency throughout use. All primer and solvent cans to have labels intact and stamped with the date of manufacture. No cans dated over one (1) year old will be permitted. Do not thin solvent or primer in any manner.

B. Pipe joint compound to be non-hardening, non-toxic materials designed specifically for use on threaded connections in water carrying pipe. Rectorseal, Permatex or equal pipe thread sealant for metal piping and PVC pipe threads. Do not use on sprinkler ports.

2.9 MISCELLANEOUS EQUIPMENT

A. Provide all equipment called for by the Drawings.

B. Extra Stock: Provide the following:

1. Five (5) additional sprinkler heads of each size and type.

2. One (1) additional sprinkler circuit electrical valve of each size and type.

3. Three (3) sets of specialized tools and wrenches for adjusting, disassembling, removing, and installing each type of head, valve or other equipment supplied on this project.

4. One (1) quick coupler key and hose swivel.

PART 3 - EXECUTION

3.1 LAYOUT AND CONSTRUCTION OF IRRIGATION SYSTEM

A. Layout and construct irrigation system to the general sizes, grades, and locations shown on the Drawings. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required, therefore sprinkler lines shown on the drawings are essentially diagrammatic. Carefully investigate the conditions affecting all of the work and plan accordingly. Establish locations of all irrigation heads, valves, pipe routing, etc. at the time of construction. Install system in such a manner to avoid conflicts with planting, utilities and architectural features. Typical spacing of the irrigation heads shown on the plans is to be exceeded only with the permission of the Architect. Adjust, add or remove heads, to achieve full coverage of all planting areas and notify Architect of the adjustments.

3.2 PREPARATION

A. Schedule and coordinate placement of materials and equipment in manner to affect the earliest completion of work in conformance with construction and progress schedule. Verify location of all existing system equipment.

B. Sleeves and Conduits: Verify that all installed sleeving and conduits are undisturbed and are free of defects or errors introduced by the work of other sections.

C. Water Meter/Water Pressure: Test and verify that existing water pressure is the minimum pressure at maximum system gpm to operate the irrigation system as specified on the Drawings. Report discrepancies to Architect before beginning installation for a determination of course of action.

D. Stub-outs: Verify that all stub-outs to be provided under another contract are correctly sized, located and installed as noted on Drawings.

E. Notification: Submit written notification to District Representative within ten (10) working days of above inspections describing all acceptable and non-acceptable site conditions.

3.3 LAYOUT

A. Lay out work as accurately as possible in accordance with diagrammatic Drawings where equipment is shown in paving adjacent the planting. Install equipment in planting areas unless otherwise noted on Drawing. Parallel lines shown on the Drawing may be placed in a common trench. Be responsible for complete and uniform irrigation of all landscape areas irrigated under this Contract.

B. Where site conditions do not permit location of piping, valves and heads where shown, notify the Architect immediately and determine relocation in joint conference.

C. Run pipelines and automatic control wiring in common trenches wherever practical.

D. Conduits and Sleeves:

1. Coordination

   a. Sleeving will exist only when installed under another subcontract. Inspect as specified above.

   b. For all other installations, provide conduit and sleeve materials and coordinate installation with other trades.

2. Extent: Install conduits and sleeves where control wires and pipes pass under paving or through walls as shown on Drawings. Extend twelve inches (12") beyond edges of paving and walls and cap ends until ready for use.

3.4 EXCAVATION AND TRENCHING

A. Excavation to be in all cases ample in size to permit the pipes to be laid at the

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elevations intended and to permit ample space for joining.

B. Make trenches for pipelines deep enough to provide minimum cover from finish grade as shown on drawings.

1. If rock does not permit trenching to a depth to allow pipe cover listed above, galvanized steel pipe will be permitted. 150 mm (6") cover and one (1) size larger than PVC size on drawings will be required.

2. Direct Burial PVC Piping Under Pavement: Provide a minimum of 4 inches of sand backfill on all sides and 24 inches cover to bottom of paving.

C. Use all means necessary to protect existing planting materials before, during, and after the irrigation installation and immediately make all repairs necessary to the approval of the District or designated representative at no additional cost to the District.

Take care to examine the existing trees that are to remain. Any roots cut that are larger than 3/4" in diameter shall be filled with a tar-base sealant immediately. Install trenches for mains and laterals, straight and true with bottoms graded on uniform slopes to low points. Make trenches wide enough to allow a minimum of 4" between parallel pipelines. Do not install parallel lines directly over one another. Maintain 2" minimum vertical clearance between irrigation lines at a minimum transverse angle of 45 degrees.

D. PVC pipe is flexible and can be curved longitudinally without affecting performance. Therefore trenches may be curved to meet the following allowable longitudinal minimum pipe bending radius for 6 m (20'-0") pipe lengths. Allowable minimum pipe bending radius:

Pipe Diameter	Bend Radius
3/4"	15'-0"
1"	19'-0"
1-1/4"	32'-0"
1-1/2"	32'-0"
2"	40'-0"
2-1/2"	48'-0"

E. Restore surfaces, existing underground installations, utilities, etc. damaged or cut as a result of excavation, to original conditions in manner approved by the District.

F. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by District or designated representative.

3.5 PIPE ASSEMBLY

A. Piping under existing concrete to be installed by jacking or boring. Where any cutting or breaking of paved asphalt surface is necessary, it is to be removed, the

installation of pipe and/or conduit completed, backfilled ,and compacted to original specifications and A.C. paving replaced to match existing paving.

B. Install plastic pipe to provide for expansion and contraction as recommended by the manufacturer. Cut plastic pipe with a pipe cutter or hack saw with the assistance of a squared-in sawing vice, to insure a square cut. Remove burrs at cut ends prior to installation so that a smooth unobstructed flow will be obtained. Use PVC pipe primer on all solvent weld PVC pipe before PVC solvent is applied.

C. Install all PVC piping in trench with manufacturer's markings (manufacturer, pipe size, schedule or class, pressure rating, etc.) facing up and readable to District during installation or later excavation.

D. Do not lay plastic pipe when there is water in the trench.

E. Remove all foreign matter and dirt from the inside of the pipe before it is lowered into position in the trench, and keep clean during and after laying the pipe.

F. Place pipe no closer than 4" to walkways and 8" from buildings.

G. Solvent Weld PVC Pipe

1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fitting of dirt, dust, and moisture.

2. Dry-insert pipe into fitting to check for mis-sizing. Pipe should enter fitting 1/3 to 2/3 depth of socket.

3. Coat the inside socket surface of the fitting and the external surface of the male end of the pipe with P-70 primer (manufactured by Weld-On, or equal). Then without delay apply Weld-On 711 (or equal) cement liberally to the male end of the pipe and also apply cement lightly to the inside of the socket.

4. Insert pipe immediately into fitting and turn 1/4 turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Align pipe and fitting properly without strain to either.

5. Hold joint still for approximately thirty (30) seconds and then wipe the excess cement from the pipe and fitting.

6. Cure joint a minimum of thirty (30) minutes before handling and at least six (6) hours before allowing water in the pipe.

H. Threaded Joint

1. Field threading of plastic pipe or fittings is not permitted. Factory-made threads only will be permitted.

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2. Use factory-made metallic nipples whenever possible. Field-cut threads in metallic pipe will be permitted only where absolutely necessary. When threading, cut threads accurately on axis with sharp dies.

3. All threaded joints to be made up with specified pipe joint compound. Apply compound to male threads only.

4. Where assembling metallic pipe to metallic fitting or valve, no more than three (3) full threads shall show when joint is made up.

5. Where assembling threaded plastic fittings, take up joint no more than one (1) full turn beyond hand tight.

6. Where assembling soft metal (brass or copper) or plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.

J. Cap open pipe ends as pipe line is assembled to prevent entrance of dirt or obstruction. Remove caps or plugs only when necessary to continue assembly. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

3.6 REMOTE CONTROL VALVE

A. General: Unless otherwise specified, the installation of valves to include excavation and backfill, and furnishing, installing and testing of risers, fittings, and valves, and all other work in accordance with the Drawings and Specifications.

B. Install where shown and on Drawings and group together where practical. Limit one (1) remote control valve per box. No exceptions.

C. Locate valve boxes 12" away from and perpendicular to walk edges, buildings and walls. Provide 12" between valve boxes where valves are grouped together. Align boxes in a row.

D. Thoroughly flush main line before installing valves.

E. Install in ground cover areas or and in lawn adjacent to walkways elsewhere where approved by the Architect. Set top of box parallel and flush with finish grade.

F. Label control line wire at each valve with a 2-1/4" X 2-3/4" polyurethane I.D. tag, indicating identification number of valve (controller and station number, available from T. Christy Enterprises). Attach label to control wire.

3.7 WIRE SPLICE ASSEMBLY

Assembly to splice and effectively moisture seal two (2) or more conductors. Install the device per manufacturer's instructions and all applicable electrical codes. Seal with specified splicing materials. In-line splicing will be allowed only on runs exceeding 2,500 feet and only in junction boxes.

3.8 CONTROL WIRING

A. Provide a cover as shown on drawings.

B. Run lines along mains wherever practical. Tie wires in bundles with pipe wrapping tape at 3 m (10'-0") intervals and allow slack for contraction between strappings. Do not tape wires together when contained within sleeving or conduit.

C. Loop a minimum of 1 m (3'-0") of extra wire in each valve box; control wire, ground wire, and spare wires.

D. Make connections to control valve wiring by twisting bare wires and securing and sealing with weatherproof wire splice assembly.

E. Locate all splices within a separate 25 mm (10") diameter plastic valve box. Do not direct bury any wire splices.

F. Where control lines pass under paving, they are to pass through Schedule 40 electrical PVC conduit.

G. Refer to the materials section of these Specifications for color coding of wiring.

3.9 VALVE BOXES

A. Remote Control Valve Boxes, Ball/Gate Valve and Quick Coupling Valve Boxes, install per details.

B. Splice Boxes

1. Install two (2) common bricks (one on each side) under base of box for support.

2. Install 3/4" diameter clean drain rock inside box.

3. No soil permitted inside box. Install .25 mm (10 mil) polyethylene tape to box side cutouts.

4. Spliced wire shall be coiled 1" diameter with 3'-0" of extra wire and each wire end weatherproofed with a splice seal assembly.

5. Indicate all splice box locations on "as-built" record drawings and "as-builts" note where the wires originate.

3.10 SPRINKLERS AND QUICK COUPLING VALVES

A. Unless otherwise specified, include the installation of QCVs, and sprinkler heads, excavation and backfill, the furnishing, installing and testing of risers, fittings,

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QCVs, and sprinkler heads, and the removal and/or the restoration of existing improvements and all other work in accordance with the Drawings and Specifications.

B. Set all irrigation heads and quick coupling valves perpendicular to the finish grade unless otherwise designated on the Plans.

C. Thoroughly flush lines before installing sprinklers or QCVs.

D. Locate and install sprinklers or QCVs as shown in the Drawings and Details.

E. Adjust sprinkler heads locations for proper, even distribution and arc of coverage. Select proper arc to fit irrigated areas.

F. Locate irrigation heads 4" inside fences, curbs, structures, and walks.

3.11 BACKFILLING

A. Do not allow nor cause any work to be covered or enclosed until it has been inspected, tested and approved by the District Contact or designated representative. Should any work be enclosed or covered before inspection and test, uncover the work, and after it has been inspected, tested, and approved, the work shall be recovered.

B. Backfill material to be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials. Carefully select backfill that is to be placed next to plastic pipe to avoid any sharp objects that may damage the pipe.

C. Backfill all pipe under asphalt paving with 6" of clean sand on all sides of pipe, unless it is contained within a sleeve.

D. Place backfill materials in 150 mm (6") layers and compact by jetting and/or tamping to a minimum compaction of 90% of original soil density.

E. Dress off areas to finish grades and remove excess soil, rocks, or debris remaining after backfill is completed.

F. If settlement occurs along trenches, and adjustments in pipes, drainage, utilities, valves, sprinkler heads, soil, sod, or paving are necessary to bring the system, drainage, utilities, soil, sod, or paving to the proper level or the permanent grade. As part of the work under this Contract, make all adjustments without extra cost to the District for one year following completion of work.

3.12 OPERATING, TESTING AND ADJUSTING SYSTEM

A. Operation

1. Routine: Inspect and adjust all spray heads and control valves including raising or lowering of spray head heights to accommodate plant growth and weather conditions.

2. Controller: Inspect regularly for power interruption and reset clock as required. Adjust station timing to accommodate changes in plant growth and weather conditions.

3. System Failure: Perform all repairs within one (1) operating period. Replacements to match removed products and materials in all respects. Report promptly all damage not resulting from Contractor's operations. Repair all damage caused by Contractor at no expense to District.

4. Irrigation controllers are E.T. based self scheduling and self adjusting. Contractor shall input all required data into controllers to allow self scheduling inclusive of plant species, plant water requirements, exposure, soil type, slope, irrigation type and irrigation efficiency.

B. Testing

1. Make hydrostatic tests when welded PVC joints have cured at least 24 hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings, valves and fittings exposed. Test shall be made when all main line and associated equipment is installed including but not limited to quick coupling valves, control valves, gate valves, etc.

2. Install two (2) pressure gauges at opposite ends of main-line system. Pump system up to a minimum of 125 psi the day preceding the scheduled test and verify that pressure is holding. Inspect system early following day and immediately notify District's Representative if the test confirmation must be postponed due to pressure not holding. If Architect is not notified, be responsible for reimbursing the Architect for the unnecessary trip at the rate of two and one half times the normal office hourly billing rate per hour portal to portal (plus transportation costs for the inconvenience. No further observation will be scheduled until this charge has been paid.

3. Apply continuous static water pressure of 125 psi in except after a drop in pressure (5 psi maximum), then the pressure must stabilize and remain stable for a two (2) hours minimum period before acceptance of the test.

4. Leaks resulting from tests shall be repaired and test repeated until system passes tests. Note: Use hydraulic pump or other safe method--do not use air compressor.

C. Adjustment

1. Adjust valves; align and adjust head coverage. If it is determined that the adjustments in the irrigation equipment will provide more uniform coverage, make all necessary changes or make arrangements with the

manufacturer to have adjustments made, prior to any planting without additional cost to the District. The entire system to be operating properly before any planting operations commence.

2. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways and buildings.

3. Set all sprinkler heads perpendicular to finished grades unless otherwise noted on the Drawings.

4. When the landscape sprinkler system is completed, perform a coverage test in the presence of the Architect to determine if the water coverage for planting areas is adequate.

5. Test controllers individually in the presence of the District's Representative and the Architect. Demonstrate that all control valves operate electronically. Provide vehicles and radio equipment as necessary to expedite this process.

6. Demonstrate to Architect that irrigation scheduling programmed into controller is adequate for plant requirements without causing runoff, and that scheduling capacities of controller are utilized.

D. Irrigation Audit:

1. Contractor shall submit an irrigation audit report to the school district upon completion of irrigation installation prior to start of maintenance. Irrigation audit shall be performed by a certified water auditor and shall comply with the "Irrigation Association Certified Landscape Irrigation Training Manual".

3.13 CLEAN-UP

When work of this Section has been completed and as directed by the District or designated representative remove all trash, debris, surplus materials, and equipment from site.

3.14 FINAL REVIEW PRIOR TO ACCEPTANCE

A. Operate each system in its entirety at time of final review. Any items deemed not acceptable shall be reworked to the satisfaction of the irrigation consultant.

B. Final review shall take place after submission of all specified lists, record drawings, and manuals.

3.15 INSPECTIONS

A. The contractor shall be subject to inspections at any and all times by authorized representatives of the Owner.

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3.16 MAINTENANCE

A. The contractor is to make all repairs and maintain the entire sprinkler system from the time of installation through the landscape maintenance period.

3.17 WARRANTY

A. The contractor shall repair or replace any irrigation found to be defective in material or workmanship within the entire sprinkler system from the time of installation through the warranty period, as outlined in the Guarantee form provided in these specifications.

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

WE HEREBY GUARANTEE THAT THE SPRINKLER IRRIGATION SYSTEM WE HAVE FURNISHED AND INSTALLED IS FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP, AND THE WORK HAS BEEN COMPLETED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS. WE AGREE TO REPAIR OR REPLACE ANY DEFECTS IN MATERIAL OR WORKMANSHIP, ANY SETTLING OF BACKFILLED TRENCHES, WHICH MAY DEVELOP DURING THE PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE AND ALSO TO REPAIR OR REPLACE ANY DAMAGE CAUSED BY ANY DEFECTS IN THE IRRIGATION SYSTEM OR RESULTING FROM THE REPAIRING OR REPLACING OF SUCH DEFECTS AT NO ADDITIONAL COST TO THE OWNER. ORDINARY WEAR AND TEAR, UNUSUAL ABUSE OR NEGLECT ARE EXCEPTED. WE SHALL MAKE SUCH REPAIRS OR REPLACEMENTS, INCLUDING COMPLETE RESTORATION OF ALL DAMAGED PLANTING, PAVING, OR OTHER IMPROVEMENTS OF ANY KIND, WITHIN A REASONABLE TIME, AS DETERMINED BY THE OWNER, AFTER RECEIPT OF WRITTEN NOTICE. IN THE EVENT OF OUR FAILURE TO MAKE SUCH REPAIRS OR REPLACEMENTS WITHIN A REASONABLE TIME AFTER RECEIPT OF WRITTEN NOTICE FROM THE OWNER, WE AUTHORIZE THE OWNER TO PROCEED TO HAVE SAID REPAIRS OR REPLACEMENTS MADE AT OUR EXPENSE AND WE WILL PAY THE COSTS AND CHARGES THEREFORE UPON DEMAND.

PROJECT: _____

LOCATION: _____

CONTRACTOR: _____

LICENSE NO: _____

ADDRESS: _____

TELEPHONE: _____

GUARANTEE TO: _____

DATE OF ACCEPTANCE:

_____

AUTHORIZED REPRESENTATIVE:

_____

END OF SECTION

SECTION 32 90 00

LANDSCAPE PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General and Supplementary Conditions and General Requirements apply to the work herein specified.

1.2 DESCRIPTION

A. Work to be Included:

1. Furnish and place topsoil, import soil, mulch, fertilizer, organic materials, and all other materials incidental to planting work.
2. Furnish all plant materials (shrubs, sod, ground covers, and plant labels).
3. Furnish all labor, equipment and materials necessary for the installation of plant materials according to these Specifications and the Plans

B. Related Work Described Elsewhere:

1. Section 32 80 00 Irrigation: Irrigation system shall be installed, automated, and operative before beginning planting operation.
2. Section 33 40 00 Storm Drainage Utilities: Contractor shall fully acquaint himself with the existing conditions particularly in reference to underground piping. Any damage caused by the Contractor to work of other trades shall be repaired by him at no cost to the District.
3. Section 31 00 00 Earthwork: Close coordination shall be maintained with those Contractors performing rough grading operations and installing utilities and pavement to insure proper timing of the work.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Perform work in accordance with all applicable laws, codes, and regulations required by the City of South San Francisco and any other authorities having jurisdiction over such work. Provide for all inspections and permits required by Federal, State, and local authorities in furnishing, transporting, and installing materials.

B. Certificates of inspection required by law for transportation shall accompany invoice for each shipment of plants. File copies of certificates with District's Representative after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.

1.4 QUALITY ASSURANCE

A. Personnel: All planting and lawn work shall be performed by personnel familiar with lawn and planting procedures under the supervision of a qualified foreman with 5 years of landscape installation experiences on projects of equal size and scope.\

B. Installing contractor shall have successfully completed within the last 3 years at least 3 planting applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.

C. Codes and Standards: Nursery stock shall meet the standards of the current edition of the "Agricultural Code of California" and the "Regulations of the Director of Agriculture Pertaining to Nursery Stock" as to grading and quality. They shall be true to type and name in accordance with "Standardized Plant Names", Second Edition.

D. Substitutions: Substitutions of plant materials will not be permitted unless authorized in writing by District's Representative. If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price. Such proof shall be substantiated and submitted in writing to District's Representative. A maximum of 10 days after award of contract the Contractor shall submit a list of available plants with a list of all nurseries and plant brokers contacted These provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials. Contractor shall secure all material within 15 days after award of contract in order to guarantee plant availability.

The Landscape Architect reserves the right to require the Contractor to replace at the Contractor's cost any plants which the Contractor has installed without the Landscape Architect's approval.

E. Plants shall be subject to inspection and approval of the Landscape Architect at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Wherever the terms "approve", "approval" or "approved" are used herein they mean approval of the Landscape Architect in writing. Plants which are contract grown shall meet or exceed all nursery standards for health and size. Plants which do not meet standards shall be rejected and the Contractor shall provide nursery grown stock as required at no additional cost to the contract.

F. Plant Certification: All plants must meet specifications of Federal, State, and County laws requiring inspection for plant disease and insect infestations. Inspection certifications required by law shall accompany each shipment, invoice and order for stock.

1.5 SUBMITTALS

A. Furnish 6 copies of manufacturers' literature for the following items:
   1. Certificates of Inspection
   2. Delivery tags for all soil amendment, soils compost, and mulch which are delivered to the site
   3. Fertilizer
   4. Fertilizer Tablets
   5. Mulch
   6. Plant supplier list
   7. Sod

B. Provide analysis from an approved testing laboratory for:
   1. Existing topsoil (1 sample per acre)
   2. Import Soil
   3. Compost
   4. Provide agricultural analysis dated within the last 3 months from an approved testing laboratory including pH, salinity, sodium hazard, boron hazard, lime content, organic matter, soil texture and available nutrient levels per Section 2.1-A.

C. Submit one (1) quart sample each of all soils, mulches and compost.

D. Foreman's Qualification Statement

E. All submittal data shall be forwarded in a single package to the Landscape Architect within 60 days of award of the contract.

F. Contractor shall select and tag all plant material within 10 days of award of contract. Plant material which is not available, or not possible to contract grow shall be noted to the Landscape Architect within 14 days of award of contract so substitutions may be selected. Contractor shall source material from out of state or thru a plant broker if not locally available. Contractor shall submit lists of all nurseries and plant brokers contacted for availability.

1.6 SAMPLES AND TESTS

A. Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request by Landscape Architect. Rejected materials shall be immediately removed from the site at Contractor's expense. Landscape soils which do not meet the recommendations of the original soils tests, shall be re-amended as required at no additional cost to the contract. Cost of testing of materials not meeting specifications shall be paid by Contractor.

1.7 SELECTION AND TAGGING OF PLANT MATERIAL

A. Plants shall be subject to inspection and approval by Landscape Architect at place of growth if the Landscape Architect so chooses, and upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Submit written request for inspection of plant material at place of growth to Landscape Architect. Written request shall state the place of growth and quantity of plants to be inspected. Landscape Architect reserves right to refuse inspection at this time if, in his judgment, a sufficient quantity of plants is not available for inspection.

1.8 JOB CONDITIONS

A. Delivery:
   1. Deliver standard products to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade mark and conformance to state law.
   2. Deliver plants with identification labels.
      a. Labels should state correct name and size.
      b. Use durable, water-proof labels with water resistant ink that will remain legible for at least 60 days.
   3. Protect plant materials during transport to prevent damage to rootball or desiccation of leaves.
   4. Remove unacceptable plant materials immediately from job site.
   5. Contractor shall endeavor to coordinate delivery with installation schedule so that plant material is installed on the same day.

B. Storage:
   1. Contractor shall maintain the plant material properly between delivery and planting. This includes protection from animals and vandals, proper watering, and feeding if necessary.
   2. Shade plants shall be stored in the shade, and sun plants shall be stored in the sun.

C. Timing: Under no circumstances shall any work be performed if the temperature exceeds 90 degrees or is below 40 degrees. No planting shall be done with the soil saturated with water.

PART 2 - PRODUCTS

2.1 SOIL AMENDMENTS

A. The organic amendments, imported soils, and fertilizer rates and quantities listed in Part Three are to be used for bid basis only. Contractor shall arrange and pay for

testing by an accredited soils laboratory approved by the District. Test the existing site soil after demolition and rough grading operations are completed. Take samples from multiple site locations to be selected by Landscape Architect. Mark location of each sample on field set plan for reference and label each sample. Adjust the quantities of soil amendments and fertilizer per soil lab written report recommendation. Submit lab report and any proposed soil amendments and cost adjustments to District for written approval. After review and written approval by the District, amend the soils according to said laboratory's recommendations. The approved soils laboratory recommendations shall be considered a part of this specification.

The base bid shall include cost of all testing site soils and organic amendments noted in this spec section. Adjustments to project costs resulting from the soil report recommendation shall be submitted as a modification to the base bid.

Within 10 days of award of contract, the landscape Contractor shall submit 1 preliminary soils tests for review of percolation rates, PH, Boron, salinity, and all other standard nutrients. The Landscape Architect reserves the right to adjust plant material specified if the site soil are deemed detrimental to those specified.

B. Topsoil: Provide topsoil as required to complete landscape work. Topsoil to be furnished shall be fertile and friable, possessing characteristics of representative productive soils on the site. It shall not contain toxic substances which may be harmful to plant growth. If herbicide contamination is suspected then a radish/rye grass growth trial must be performed. Consult with Landscape Architect prior to decision to test. It shall be uniformly textured and free of all objectionable foreign materials, oil, or chemicals which may be injurious to plant growth. Natural topsoil shall possess a pH factor between 5.5 and 7.5, a sodium adsorption ratio (SAR) of less than 4, a boron concentration of the saturation extract of less than .7 ppm, and salinity of the saturation extract at 25 degrees C. of less than 4.0 millimhos per centimeter.

Obtain topsoil from naturally well- drained sites where topsoil occurs in a depth of not less than 4 inches; do not obtain from bogs or marshes. Topsoil from the project stockpile which meets the requirements is acceptable.

C. Imported Topsoil: Topsoil shall be tested by an approved soils laboratory for compatibility with existing on-site soils and fertility. Contractor shall submit soil laboratory's analysis and amendment recommendations. Imported topsoil shall be subject to inspection by Landscape Architect at the project site. Remove rejected topsoil immediately at Contractor's expense. The imported topsoil shall be blended on site with the following ratio:

1 part of compost blended with 2 parts of imported soil.

D. Compost:

Compost: Feedstock shall be no longer recognizable. Compost shall contain fairly uniform particle size, no weed sprouts. Submit a nutrient analysis and testing data from a third party or soil lab, such as the STA Seal of Testing Assurance by the US Composting Council; or OMRI, Organic Materials Review Institute. Compost shall be

Super Humus Compost, available from BFI Organics: 408-945-2836, or approved equal. Compost shall be purchased from local, organic materials such as plant or wood waste.

Compost shall meet the following criteria:

1. Particle size: 100% passing a 1" screen or smaller
2. Salt Concentration: Must be reported; may vary but < 4.0 mmhos/cm preferred. Soil should be test. <2.5 mmhos/cm preferred for soil/compost blend.
3. Feedstock Materials shall be specified and include at one or more of the following: landscape/yard trimmings, grass clippings, food scraps, and agricultural crop residues.
4. Nutrient Content: provide analysis detailing nutrient content including N-P-K; Ca; Mg; S; and Bo. Nitrogen content 1% or above preferred.
5. Trace Contaminants Metals (Lead, Mercury, etc.). Product must meet US EPA, 40 CFR 503 regulations.
6. pH: pH shall be between 5.5 and 8.
7. Visible Contaminants: compost shall be relatively free of inert ingredients, including glass, plastic and paper, < 0.1 % by weight or volume.
8. Moisture Content shall be between 35% - 55% of dry solids.
9. Organic Matter Content: 50% - 60% by dry wt. preferred, 30-70% acceptable.
10. Carbon and Nitrogen Ratio: C:N < 20:1
11. Stability/Maturity: shall have a dark brown color and a soil-like odor. Compost exhibiting a sour or putrid smell, containing recognizable grass or leaves, or is hot (120F) upon delivery or rewetting is not acceptable.
12. Weed seed/pathogen destruction: provide proof of process to further reduce pathogens (PFRP). For example, turned windrows must reach min. 55C for 15 days with at least 5 turnings during that period.

2.2 FERTILIZER:

A. Quick-release fertilizers shall not be permitted. Fertilizers as recommended by the soils report. Manufacturer: Growpower Plus or approved equal.

2.3 PESTICIDES:

A. Prohibit the use of pesticides that are prohibited by Organic Materials Research Institute in its generic materials list.

2.4 RECYCLED TOP MULCH

B. Medium Decorative Mulch (2 inch grind – all product passes 2 inch screen) or approved equal. Available from: BFI Organics 408-945-2836. Recycled mulch shall

be purchased from local, organic materials such as plant or wood waste. 3" layer, Color : Brown

2.5 GROUNDCOVERS, AND SHRUBS

A. All plant materials shall be nursery grown in accordance with the best known horticulture practices and under climatic conditions similar to those in the locality of the project. Container stock shall have grown in the containers in which delivered for at least six (6) months, but not over two years. No container plants that have cracked or broken balls of earth when taken from container shall be planted except upon special approval by Landscape Architect.

B. Plants shall be vigorous and shall have a normal habit of growth. Plants shall be free of damage by insects, pests, diseases or wind; burns from insecticides or fertilizer; and stunted growth due to lack of water, lack of food, diseases, or other causes. Plants shall be in conformity with the sizes shown on the drawings.

C. Quantities: Quantities necessary to complete the work as shown on the drawings shall be furnished.

D. Root Systems: All shrubs and trees shall have a normal root system. No plants with roots that have encircled themselves will be accepted. In case of any unsatisfactory root system, a total group of plants may be rejected.

2.6 WATER SOURCE

A. Irrigation Water source shall be part of contract. Contractor shall provide transport of additional supply if required.

2.7 ROOT GUARDS

A. Deep Root Model UB 24-2 shall be used on all trees 6' or closer to pavement, utilities, curbs, etc. Deep Root (415) 344-1464. As shown on plan.

2.8 SOD

A. Sod shall be one year old and dense with grass, having been mowed at 1 in. height before lifting from field. All grown on fumigated soil. Sod shall be in vigorous condition, dark green in color, free of disease and harmful insects. Sod shall be grown of seed mix of the following proportions by weight:

90/10 Fescue Mix

2.9 HEADERS

A. Per plan.

2.10 FERTILIZER TABS

A. Tablets shall be 12-8-8, 7 gram tablets as manufacturer by GroPower.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspections by the Landscape Contractor:

1. Prior to all work in this section, verify grades and carefully inspect the installed work of all other trades. Verify that all such work is complete to the point where the installation may properly commence.
2. In the event of discrepancy, immediately notify the Landscape Architect. Do not proceed with this installation in areas of discrepancies until all such discrepancies have been fully resolved.
3. Inspect trees, shrubs and ground cover plants for injury, insect infestations, and proper pruning.
4. General contractor shall coordinate rough grading of site to ensure the Landscape Contractor receive all planting areas graded to ±0.10 ft. of finish grades shown on the Drawings. Allow for depth of imported soils, soil amendments, and mulch in determining the difference between finished subgrade in groundcover and shrub beds. Verify that subgrades are not compacted. Do not proceed until detrimental conditions are corrected. Contractors shall take precaution during the excavation of all planting areas to not undermine or damage all adjacent pavements, footings and their associated subgrades.

3.2 SOIL PREPARATION

A. The Contractor shall prepare the site for landscaping. In the areas designated for landscaping on the plans, he shall, prior to placing imported material, replacing existing topsoil,, amending soils, or doing any planting, clear the areas of weeds, roots, debris, rocks, and underground obstructions, and construction debris to a depth acceptable for planting. Scarify the subgrade to a 12" minimum depth prior to spreading topsoil.

B. The Contractor shall alleviate compacted soils before planting, for all landscaped areas that cannot be protected during construction.

1. Scarification: Scarify all planting areas prior to fine grading in order to ensure relative compaction of 85% or less. Any planting areas which become compacted in excess of 85% due to construction activities shall be thoroughly

cross-ripped to the maximum depth feasible to alleviate that condition, taking care to avoid all existing drainage and subsurface utility lines. See plans.

C. Place all import soil in 6" lifts and compact to 85%. Water import soil thoroughly and add additional soil as required to maintain grades prior to planting operations.

D. A minimum of 2" of quality recycled compost is tilled into all planting areas. Quality to be per Soils Test Lab recommendations.

E. Cultivation and Placement of Amendment:
   1. In areas to be planted with shrubs cultivate to a depth of 12".
   2. In groundcover and lawn areas, cultivate soil to a depth of 8".
   3. Incorporate 6.25 cubic yards per 1000 square feet of organic compost. Prior to planting incorporate to a depth of 6" the following fertilizers:
      Per 1000 square feet of shrubs and groundcovers areas:
      150 lbs Grow Power Plus fertilizer
      Per 1000 square feet of lawn areas:
      150 lbs Grow Power Plus
   4. Areas within the driplines of existing trees shall be hand cultivated.

F. Soil Mix for Backfill of Shrubs: The following ingredients shall be tumbled to achieve a homogeneous mix:

Compost	1 cubic yard
Imported Soil	2 cubic yards
Fertilizer	30 lbs

G. Finish Preparation in Lawn Areas:
   1. Roll to compact amended soil to not more than 85% compaction. Finish grade shall be 1" below adjacent paving, curbs, or walls unless otherwise shown on drawings. Finish out to smooth, even surface conforming to established grades after settlement. Rake immediately prior to planting.
   2. If rain is likely between completion of soil preparation and planting, precautions shall be taken to prevent erosion of the soil.

H. Finish Grading:
   1. Finely finish surfaces by raking smoothly and evenly. Remove all exposed, extraneous matter one inch or larger in size to facilitate natural runoff. Drag to smooth surface.
   2. Finish grades will slope to drain, without water pockets or irregularities (humps or hollows). Finish grades will meet all existing controls and shall be 1 ½ inches below adjacent top of paving, curbs, sidewalks and planters, unless otherwise noted on plans. Grades will be of uniform slope between points of fixed elevation. Establish vertical curves or rounding at abrupt changes in slope.
   3. All finish grades will be approved by the engineer prior to commencing the planning operations.

I. Soil mix for Stormwater Treatment Areas: Scarify subgrade 12" min. Soil mix shall be boot compacted in 6" lifts and graded to drain per the drawings. See civil drawings

3.3 SHRUBS

A. Preparation:

1. Stake out location for plants and outline of planting beds on ground and obtain the approval of Landscape Architect before digging.
2. The Contractor shall protect all utilities, vegetation, and structures during work.

B. Excavation:

1. All plant pits shall be dug with vertical walls. The sides and bottoms of all planting pits shall be thoroughly scarified.
2. Holes for one (1) gallon size plants: Twelve (12) inches wider than the can and six (6) inches minimum deeper.
3. Holes for (5) gallon size plants: eighteen (18) inches wider than the can or root ball, and eight (8) inches deeper than can or root ball.

C. Plants in Containers:

1. Plants shall be removed carefully from their containers after the containers have been cut on two sides minimum; fifteen-gallon containers shall be opened in three places. In the case of boxed plant specimens, the wood shall be removed at the sides and at the bottom of the box.
2. After removing plant material from its container, stimulate root growth by making four or five vertical cuts 1" deep around the circumference of the root ball.
3. Do not lift or handle plants by the top, stems, or trunk at any time. All plants shall be lifted in such a manner that the root ball is supported from the underside.
4. The Contractor shall check all plants for adequate root systems. If the root system is defective, he shall remove deficient plants from the site and replace them with new ones.

D. Planting:

1. Center plant in pit or trench over tamped mound.
2. Face for best effect.
3. Set plant plumb and hold rigidly in position.
4. All plants shall be set in the ground so that the root ball will be flush with the finish grade. All plants that settle below the finish grade within 30 days of acceptance of the work shall be replanted in the proper position. In case a total section of planting area settles, the Contractor shall lift the plants, import additional soil mix, regrade, and replant, at no additional cost to the District.
5. Use soil mix only for backfill. Backfill pit with soil mix in 9" layers and water each layer thoroughly to settle soil. The filled pit shall be flush with surrounding grade when complete.

6. When the plant pit has been approximately one half filled, place planting tablets according to the manufacturer's schedule.
   a. 1 Gallon: 3 tablets
   b. 2 Gallons: 6 tables
   c. 5 gallon: 9 tablets
7. Apply post-planting organic fertilizer, per soils report.
8. In shrub mass areas, mulch area between plant pits with 3" layer of wood chip mulch.
9. Planting operation for plants in raised concrete planters is same as above except that finish grade of soil mix shall be 1 1/2" below top of planter walls. Planters may be backfilled with excess topsoil up to the depth specified for plant pits above which backfill shall be soil mix.
10. Planting operations for plants in precast planters is the same as stated in paragraph 9 above. Fill entire planter with soil mix. Place planters as shown on planting plans.

3.4 GROUNDCOVER AREAS

A. Planting:
1. Space plants equally and uniformly at spacings indicated on the Drawings, which are the maximum and in a triangular pattern.
2. Plant pits shall be sufficiently large so that the root can be freely suspended in the pit. After backfilling the pit, firm the soil so that there will be no air space around the roots.
3. Apply post-planting organic fertilizer, per soils report.
4. Mulch all ground cover areas with 3" layer of Pro-Chip manufactured by BFI Organics or equivalent recycled wood chip mulch.

3.5 SOD LAWN

A. Inspection:
1. Upon the completion of the placing of the soil and prior to placing sod, the Contractor shall call for an inspection of the lawn irrigation system. The sod shall be placed after the Landscape Architect has satisfied himself that the irrigation system is operating satisfactorily and finish grade is in accord with the Drawings.

B. Laying Sod:
1. Remove all rubble, sticks, rocks and stones 1" or larger from top 2" amended soil.
2. Lay sod without stretching. Stagger end seams and butt edges as close as possible to each other. Roll with sod roller perpendicular to direction it was laid.
3. Apply post-planting fertilizer.

4. Irrigate to an 8" soil depth immediately after planting and then irrigate lightly every day to maintain adequate moisture level through establishment period.
5. Arrange for delivery of sod in the morning to insure same-day installation.
6. At the time of final inspection the lawns shall be dense, green, and weed free. It is the Contractor's responsibility to eliminate any bare spots, dead areas and weeds.

3.6 PRUNING

A. Tree and Shrub: Pruning shall be performed as required to maintain a natural appearance, promote healthy and vigorous growth, and eliminate diseased or damaged growth.

B. Trees shall be pruned to thin crown and avoid wind damage, eliminate narrow V-shaped branch forks that lack strength, eliminate sucker growth, and maintain a radial branching pattern to avoid crossing branches.

C. Under no circumstances will stripping of lower branches ("raising-up") of young trees be permitted. Lower branches shall be retained in a "tipped back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk).

D. Major pruning of trees to compensate for root loss or for aesthetic reasons shall be done only with approval of the Landscape Architect.

E. Shrubs shall not be clipped into balled or boxed forms, unless such is required by the design and directed by the Landscape Architect.

F. All pruning shall be made flush to lateral branches, buds, or trunk. "Stubbing" will not be permitted.

G. Damage: All cuts over 1" resulting from pruning or wind breakage shall be inspected periodically for insect infestation or disease.

3.7 CLEAN UP

A. Keep all areas of work clean and neat at all times. Upon completion of planting, all cans, boxes, and other debris that is a part of the planting operation shall be removed from the site.

B. All pavements shall be washed off, and site shall be left in an absolutely clean condition. All planting areas shall be cultivated and weed free before final inspection. Clean-up operations shall take place throughout the course of work so that walks and drives are clean at all time.

3.8 INSPECTIONS

A. Notification: The Contractor shall notify the Landscape Architect a minimum of 72 hours before requiring a visit by the Landscape Architect or his duly appointed representative to the site.

B. Check Points: The following shall be considered check points and the Contractor shall only proceed with the work after the Landscape Architect has visited the site and determined that the work is proceeding satisfactorily.

1. Completion of placement of soil mix and fine grading.
2. When plant material is placed in the configuration shown on the Drawings before planting.
3. A check visit shall be made to begin the maintenance period. At this time the Contractor shall have completed all phases of the Plans and Specifications. Any discrepancies shall be noted at that time and the Contractor shall make appropriate corrections before the acceptance of the work.
4. A conference including the District shall be held at the completion of the work, provided that all deficiencies brought out in the check visit which began the maintenance period have been corrected by this time. The Contractor shall continue to maintain the project at his own expense until all deficiencies have been corrected, at which time the Contractor shall request the Landscape Architect to visit the site and approve the project as complete. The Landscape Architect will accept the landscape project in writing. The date of the acceptance letter shall be the first day of the guarantee period.

C. Should it be determined at the Final Inspection or Final Acceptance visit that any punchlist item is incomplete, any further review of the site will be terminated until all items are guaranteed, in writing, to be complete by the Contractor. The cost of additional site visits by the Landscape Architect to verify completion of work shall be paid for by the Contractor.

3.9 MAINTENANCE

A. Contractor shall furnish all labor, material, equipment, and services required to maintain the landscape in a healthy and attractive condition for a period of 90 days.

B. Maintenance shall include fertilization, watering, insect and disease control (IPM), and weed control using IPM, weekly trash removal, mulching, restaking trees, tightening of guys, resetting plants to proper grades or upright position, and restoration of watering basins.

C. Maintenance period shall not start until all elements of construction, planting, and irrigation for the entire project are complete. Project will not be segmented into maintenance phases, unless specifically authorized in writing by the District's authorized representative.

D. Grades for all planting areas shall property drain. Any soil compactor resulting in lower finish grades not per plan shall be fully corrected at the contractor's expense.

E. The Contractor shall request an inspection to begin the plant maintenance period after all planting and related work has been completed in accordance with the Contract documents. A prime requirement is that all groundcover and lawn areas be planted. If such criterion is met to the satisfaction of the Architect, a field notification will be issued to the Contractor to establish the effective beginning date of the period.

F. The Contractor's maintenance period will be extended if the provisions required within the plans and specifications are not filled.

G. Watering:

1. All plants shall be kept watered as often as it is necessary to keep them in optimum, vigorous growth. Watering shall be done preferably during the early morning hours. Check soil moisture levels with a soil probe before watering and adjust watering schedule to match weather conditions.
2. Water shall be controlled so that there will be no excessive run-off, ponding, or overwatering. Check and adjust irrigation system on a weekly basis.
3. Root Growth: Periodically the Contractor shall check the progress of the root growth within the back fill area. As the root growth increases beyond the root ball, the frequency of watering shall be reduced so that the roots are encouraged to grow to a lower soil depth. Watering then shall be less frequent, but applications shall be very slow and the Contractor shall assure himself that water does penetrate to the depth of the former plant pit.
4. Replace broken equipment immediately with equal or superior materials.

H. Spraying:

1. Utilize IPM practices for plant care, as outlined in the Bay Friendly Landscape maintenance specifications. Spraying shall only be performed as a last resort under District review and approval.
2. All shrubs and trees shall be inspected at least twice a month during the growing period to determine the need for spraying to control insect damage, fungus development or any other disease that might be attacking the plants. Preventative spraying shall be done only with the approval of the Landscape Architect.
3. Operators of spray equipment shall take all reasonable precautions to protect themselves, other people and buildings from spray. The Contractor shall have all permits and licenses required for such an operation. Where applicable, dormant spray shall be applied to shrubs and trees during the winter period.
4. All equipment shall be properly washed before and after use.
5. No spraying shall take place during windy or gusty days.

I. Staking and Guying: Stakes and guys shall be inspected a minimum of two times a month to assure that the wires and ties are tight and no damage has occurred to the tree trunk or branches.

J. Weed Control:

1. Weeds shall be kept under control, preferably either by hand or by IPM methods outlined in the Bay Friendly Landscape maintenance specifications. The application of herbicides shall not be allowed unless approval by the District.
2. All equipment used for herbicides, if utilized, shall be properly cleaned before it is used on this project. Herbicides shall be applied at temperatures recommended by the manufacturers. Herbicides shall not be used during windy or gusty days. All possible precautions shall be taken to protect vegetation which is susceptible to damage from the particular herbicides to be used.
3. The bases of all plants shall be kept completely free of weeds. Periodically, the base of the trees and shrubs shall be cultivated in order to allow better penetration of water, but such cultivation shall be carefully done in order not to destroy surface roots.

K. Fertilization: Contractor shall provide eight additional soils tests prior to the end of the 90 day maintenance period for final fertilization requirements. Contractor shall fertilize all areas as recommended by soils test. Top dress all areas at 45 day intervals from time of planting with organic fertilizer as recommended by soils report. 20lbs fertilizer per 1000 s.f.

L. Litter: The Contractor shall remove promptly after pruning, trimming, and weeding or other work required under the contract, all debris generated by his performance of the work. Immediately after working in the areas of public walks, driveways or paved areas, they shall be vacuumed clean with suitable equipment. All areas covered by this contract shall be kept free of the following items: bottles, cans, paper cardboard or metallic items. Common debris and litter shall be disposed of in an appropriate manner.

M. Pruning: Prune as necessary to remove injured twigs and branches, dead wood, and suckers.

N. All green waste shall be taken to a certified green waste facility for utilization in organic compost or mulch.

O. Soil shall not be worked when wet, generally between October and April for on-going maintenance.

P. Re-apply organic mulch to a minimum depth of 3 inches for on-going maintenance.

Q. The use of pesticides that are prohibited by Organic Materials Research Institute in is generic material list is not allowed for on-going maintenance.

R. Mowing:

1. All mowing shall be done in a neat and orderly manner. Equipment shall be moved onto and off the area to be mowed in such a manner that it will not leave tracks or marks that detract from the finish turf. Timber shall be provided to move equipment over curbs, stairs, or similar constructions.

2. Mowing equipment shall be kept in optimum operating condition. The equipment shall be washed before initial use on the project so that there will be no chance of introducing foreign seeds or diseases onto the project.
3. Frequency of mowing shall be determined by the rate of growth of the grass. During seasons of peak growth mowing may have to be done every five days to six days; under normal conditions once a week should be adequate.
4. The average mowing height shall be 1-1/2". The grass blades must be cut sharply and cleanly. The turf must be cut evenly so that no ridges remain in the finish cut. The direction of mowing shall be alternated each time.

3.10 GUARANTEE AND REPLACEMENT

A. Guarantee period shall be extended for a period of one year from the date of written acceptance and once a warranty walk has been completed with the District. The Contractor shall schedule a one year walk with the District for review of all plant material. Failure to schedule a one year maintenance walk will not relieve the Contractor of the guarantee.

B. All plants shall be guaranteed to be alive and healthy as determined by the Landscape Architect at the end of the guarantee period.

C. Plant materials supplied by District shall be under similar warranty against defective workmanship during the planting operations. Plant material exhibiting conditions which are determined by the Landscape Architect as being unacceptable, due to workmanship by the Contractor, shall be replaced at no additional cost to the District.

D. The Contractor shall replace, in accordance with the Drawings and Specifications throughout the guarantee period, any plants that die, or in opinion of the Landscape Architect, are in an unhealthy or unsightly condition, and or have lost their natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or any other causes due to the Contractor's negligence. The Contractor shall not be held responsible for acts of vandalism occurring after the beginning of the guarantee period.

END OF SECTION

SECTION 33 11 00
WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide water distribution system as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of General Requirements.
   1. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   2. Materials list of items proposed to be provided under this Section;
   3. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   4. Names and addresses of the nearest service and maintenance organization that readily stocks repair parts;
   5. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. General:
   1. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required.
   2. Pipe materials less than 3" size: Use rigid copper, type K pipes.
   3. Pipe materials 3" size and larger: Use cast iron, ductile iron, or plastic pipes unless otherwise indicated or approved in advance by the Architect.

B. Pipe less than 3” diameter: All domestic water supply (potable) plumbing shall be rigid copper, type K including all pipes and fittings. Provide the following materials:

1. Above ground, provide Type “L” copper.
2. Below ground, provide Type “K” copper.

C. Pipe 3” diameter and larger:
   1. Cast iron pipe:
      a. Comply with ANSI A-21.6 or ANSI A-21.8, with working pressure of not less than 150 psi unless otherwise shown or specified.
      b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
   2. Ductile iron pipe:
      a. Comply with ANSI A 21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.
      b. Use cement mortar lining complying with ANSI A 21.4 or AWWA C205, standard thickness.
   3. Plastic pipe:
      a. Use polyvinyl-chloride (PVC) complying with AWWA C900, Class 150 DR 18.

D. Joints:
   1. Copper Water Tube:
      a. Joints in copper tubing shall be made by the appropriate use of approved copper or copper alloy fittings.
      b. All connections to be sweated.
      c. Excessive Water Pressure. Where local static water pressure is in excess of eighty (80) pounds per square inch (551 kPa), an approved type pressure regulator preceded by an adequate strainer shall be installed and the static pressure reduced to eighty (80) pounds per square inch (551 kPa) or less. For potable water services up to and including one and one-half (1-1/2) inch (38.1 mm) regulators, provision shall be made to prevent pressure on the building side of the regulator from exceeding main supply pressure. Approved regulators with integral bypasses are acceptable. Each such regulator and strainer shall be accessibly located and shall have the strainer readily accessible for cleaning without removing the regulator or strainer body or disconnecting the supply piping. All pipe size determinations shall be based on eighty (80) percent of the reduced pressure when using Table 6-4.
   2. Insulating joints:
      a. Provide between non-threaded ferrous and non-ferrous metallic pipe, fittings, and valves.
      b. Use sandwich type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts.
      c. Use full faced insulating gaskets with outside diameter equal to the flange outside diameter.
      d. Use full length bolt insulating sleeves.
      e. Install in a manner to prevent metal-to-metal contact of dissimilar metallic piping elements.

E. Valves
1. Gate valves:
a. Use ball valves designed for a working pressure of not less than 150 psi. Ball valves district standard on all sites.
b. Provide connections as required for the piping in which they are installed.
c. Provide a clear waterway equal to the full nominal diameter of the valve, openable by turning counter clockwise.
d. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.
e. Valves smaller than 3":
1) Provide all bronze, screwed, single wedge disc, screw-in bonnet, packing gland, and nut, with non-rising stem.
2) Buried valves: Install in suitable precast concrete hand hole with cover marked "WATER."
f. Valves 3" and larger:
1) Design in accordance with AWWA C500, standard, bronze trimmed, non-rising stem, solid wedge disc valves.
2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
3) Provide tee handle socket operating wrenches of suitable size.
2. Check valves:
a. Use check valves designed for a working pressure of not less than 150 psi, or as indicated or directed, with a clear waterway equal to the full nominal diameter of the valve.
b. Use valves designed to permit flow in one direction, when the inlet pressure is greater than the discharge pressure, and to close tightly to prevent return flow when discharge pressure exceeds inlet pressure.
c. Distinctly cast on the body of each valve:
1) Manufacturer's name, initials, or trademark by which he can be identified readily;
2) Valve size;
3) Working pressure;
4) Direction of flow.
d. Valves 2" and smaller: Provide all bronze, designed for screwed fittings.
e. Valves larger than 2":
1) Provide iron body, bronze mounted, with flanged ends, of the non-slam type;
2) Provide class 125 flanges complying with ANSI B-16.1.

F. Service fittings:
1. PVC mains smaller than 2" in diameter:
a. Make 3/4" maximum service with tees or plastic valve tees.
b. Acceptable products:
1) As manufactured by Mueller Company, Decatur, Illinois.
2. PVC mains 2" to 3-1/2" in diameter: For 3/4" service to 1" service, use bronze service clamp and bronze corporation stop designed for PVC pipe.
3. Service clamps and corporation stops:

a. Use bronze.
b. Provide service clamp with flattened straps and molded neoprene gaskets.

4. Services larger than those stated above: Make with standard tees on new lines, and tapping tees on existing lines.

2.2 TAPPING SLEEVES

A. Provide sleeve type coupling for existing water mains, furnished with outlet flanged to American 125 standard (ASA series 15):
1. Acceptable products:
a. Clow Corporation, Corona, California; boltless type:
1) Model C1 series for existing cast iron mains, complying with AWWA class A;
2) Model CA for class 150 and class 200 existing asbestos cement mains.
b. Coordinate requirements of tapping sleeves with gate valves and other fittings as required.

2.3 VALVE BOXES

A. Valves 3" and larger:
1. Use service box of cast iron, extension type of the required length, with screw adjustment.
2. Provide the word "WATER" cast into the cover.
3. Acceptable products:
a. Alhambra Foundry Company, Alhambra, California:
1) For valves 6" and smaller: Model A-3004;
2) For valves 8" and larger: Model 3005.

B. Valves 2-1/2" and smaller:
1. Use precast concrete box with the word "WATER" cast into the cover.
2. Provide risers on pipe line to place valve within box depth.
3. Acceptable products:
a. Manufactured by Brooks Products, Inc., El Monte, CA.
b. Or equal

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENT

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 HANDLING

A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
   1. Carry pipe into position; do not drag.
   2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Architect.

C. Before installation, inspect each piece of pipe and each fitting for defects:
   1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements, and without additional cost to the Owner.

D. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.4 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe.

B. Unless otherwise recommended by the pipe manufacturer, and authorized by the Architect, cut pipe with mechanical cutter only.
   1. Use wheel cutters when practicable.
   2. Cut plastic pipe square, and remove all burrs.

3.5 LOCATING

A. Locate water pipe at least ten feet away, horizontally, from sewer pipes.
   1. Where bottom of the water pipe will be at least 12" above top of the sewer pipe, locate water pipe at least six feet away, horizontally, from the sewer pipe.

B. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing, or provide pressure pipe with no joint located within 36" of the crossing.
   1. Cross water lines in cases above sewage force mains or inverted siphons at least 24" above the sewer line.
   2. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.

C. Do not place water lines in the same trench with sewer lines or electric wiring.

3.6 JOINT DEFLECTION

A. Cast iron pipe:
   1. Maximum allowable deflection will be given in AWWA C600.

2. Table I shows maximum deflections for 18 foot lengths of pipe. For other lengths, deflection may vary proportionately.
3. If alignment requires deflection exceeding limits shown in Table I, furnish special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limits shown.
4. Table I, deflection in inches:

Diameter:	Push-on joint pipe:	Mechanical joint pipe:
3"	19"	31"
4"	19"	31"
6"	19"	27"
8"	19"	10"

B. Plastic pipe: Unless a lesser amount is recommended by the pipe manufacturer, maximum allowable deflections from a straight line or grade, or offsets, will be five degrees.

3.7 PLACING AND LAYING

A. General:
1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the Architect.
2. Do not dump or drop any of the materials of this Section into the trench.
3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
5. Take up and relay pipe that has the grade or joint disturbed after laying.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings, and valves when work is not in progress.
8. Where any part of coating or lining is damaged, repair to the approval of the Architect and at no additional cost to the Owner.

B. Plastic pipe:
1. Position pipe and fittings in trench in a manner that identifying markings will be readily visible for inspection.
2. Cutting and joining:
   a. Protect against abrasion from serrated holding devices.
   b. Remove burrs and glosses from surfaces to be jointed; use abrasive paper, file, or steel wool.
   c. Remove dirt, dust, and moisture by wiping clean with chemical cleaner or dry cloth.
   d. Using a pure bristle paint brush, apply an even coat of the specified solvent cement in the fitting socket and on the surface of the pipe to be joined

e. Promptly insert pipe into bottom of the fitting socket; turn the pipe slightly to assure an even distribution of cement.
f. Remove excess solvent cement from exterior of the joint.
g. Should cement begin to dry before the joint is made, reapply cement before assembling.
h. Allow at least one hour for the joint to gain strength before handling or installing the pipe.

3. Do not thread plastic pipe; make connections only with the solvent cement or with special adapter fittings designed for the purpose.
4. Align pipe system components without strain.
5. Support piping at intervals of not more than four feet, at ends, branch fittings, and change of direction or elevation.
6. Support plastic pipe in trenches with a 3" layer of sand. Allow no rocks, debris, or potentially damaging substances within 6" of plastic pipe in trenches.
7. Provide an electrically continuous type tracing wire insulated number 12 – gauge copper wire tracer wire in the trench along the pipe, fastened to the pipe at 20 foot intervals, and terminating aboveground with a 12" lead taped around each riser.

C. Connections: Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

D. Sleeves:
1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

3.8 JOINTING

A. Joints:
1. Cast iron pipe, ductile iron pipe, mechanical joints, and push-on type joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe.
2. Make connections between different types of pipe and accessories with transition fittings.
3. Rubber gaskets: Handle, lubricate where necessary, and install in strict accordance with the recommendations of the manufacturer.

3.9 SETTING VALVES AND VALVE BOXES

A. General:
1. Center valve boxes on the valves, setting plumb.
2. Tamp earth fill around each valve box to a distance of four feet on all sides, or to the undisturbed trench face if less than four feet.
3. Tighten stuffing boxes, and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:
   1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.
   2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways.

3.10 THRUST BLOCKS

A. General:
   1. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees, and bends deflecting 22-1/2 degrees or more either vertically or horizontally, and on water lines 6" in diameter or larger.
   2. Provide concrete thrust blocking with a compressive strength of at least 2500 psi in 28 days.

B. Installation:
   1. Locate thrust blocking between solid ground and the fitting to be anchored.
   2. Unless otherwise shown or directed by the Architect, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
   3. Sides of thrust blocking not subject to thrust may be placed against forms.
   4. Place thrust blocking so the fitting joints will be accessible for repair.
   5. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

3.11 TESTING AND INSPECTING

A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the Architect.

B. Hydrostatic tests:
   1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise directed by the Architect.
   2. Devise a method for disposal of waste water from hydrostatic tests, and for disinfection, as approved in advance by the Architect.

C. Pressure tests:
   1. After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping to a hydrostatic pressure of 200 psi.
   2. Open and close each valve several times during the test.
   3. Carefully examine exposed pipe, joints, fittings, and valves.
   4. Replace or remake joints showing visible leakage.
   5. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings, and valves. Replace with sound material and repeat the test until results are satisfactory.
   6. Make repair and replacement without additional cost to the Owner.

D. Leakage test:
1. Conduct leakage test after the pressure test has been completed satisfactorily.
2. Duration of each leakage test: At least two hours.
3. During the test, subject water lines to a pressure of 200 psi.
4. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
5. No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by formula: "L = 0.00304 ND x sq root of P," where:
   a. L = allowable leakage in gallons per hour;
   b. N = number of joints in length of pipe under test;
   c. D = nominal diameter of pipe in inches; and
   d. P = average test pressure in lbs per sq inch.
6. The allowable leakage in gallons per hour, per joint, at 200 psi average test pressure shall be in accordance with Table II.
7. Should any test of pipe disclose leakage greater than that specified in Table II, locate and repair the defective joint or joints until the leakage is within the specified allowance, and at no additional cost to the Owner.
8. Table II:

Diameter:	Leakage in gal:	Diameter	Leakage in gal:
2"	0.0153	12"	0.0915
3"	0.0231	14"	0.1070
4"	0.0306	16"	0.1225
6"	0.0458	18"	0.1375
8"	0.0610	20"	0.1530
10"	0.0765	24"	0.1830

E. Time for making test:
1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines jointed with rubber gaskets, mechanical, or pushon joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.
2. Cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

F. Disinfection:
1. Before acceptance of the potable water system, disinfect each unit of completed water supply, distribution, and service line in accordance with AWWA C651-92.
2. Perform all such tests and disinfection in a manner approved by governmental agencies having jurisdiction.
3. Furnish two copies of a Certificate of Disinfection to the Architect.

3.12 PAINTING

A. Paint valves, pipe, and vents exposed to view.

END OF SECTION 33 11 00

SECTION 33 12 00
UTILITY VALVES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Valves and hydrants used in piped utility distribution systems

1.2 RELATED SECTIONS

A. Section 33 11 00 "Utility Distribution Systems"

1.3 REFERENCES

A. The following documents form a part of these specifications to the extent stated herein.

B. Code of Federal Regulations (CFR)

1. 29 CFR 1910.7 Definitions and Requirements for a Nationally Recognized Testing Laboratory (NRTL)

C. American National Standards Institute (ANSI)

D. American Society of Mechanical Engineers (ASME)

1. ASME B16.1Cast Iron Pipe Flanges and Flanged Fittings

E. ASTM International (ASTM)

1. ASTM A 48 Gray Iron Castings
2. ASTM A 126Gray Iron Castings for Valves, Flanges, and Pipe Fittings
3. ASTM A 436Austenitic Gray Iron Castings
4. ASTM A 536Ductile Iron Castings

F. American Water Works Association (AWWA)

1. AWWA C500 Metal-Seated Gate Valves for Water Supply Service
2. AWWA C502 Dry-Barrel Fire Hydrants
3. AWWA C504 Rubber-Seated Butterfly Valves
4. AWWA C509 Resilient-Seated Gate Valves for Water Supply Service
5. AWWA C550 Protective Interior Coatings for Valves and Hydrants

1.4 DEFINITIONS

BB	=	Bolted bonnet
IBBM	=	Iron body, bronze mounted
NBR	=	Acrylonitrile/butadiene
NRS	=	Nonrising stem
NST	=	National Standard fire hose thread
OS&Y	=	Outside screw and yoke

PTFE = Polytetrafluoroethylene
WOG = Water, oil, and gas (pressure)
WP = Working pressure

PART 2 - PRODUCTS

2.1 VALVES

A. Gate Valves:

1. V-1F: Sizes 2 through 12 inches, IBBM, 200-lb cold water, class 125 ANSI flange, double-disc, NRS with 2-inch square operating nut (installed with adapter if necessary), o-ring stem seal (packing gland not acceptable), coal tar or asphalt-varnish dipped, AWWA C500; Mueller "A2380-6," Stockham "G-745-0," American-Darling "52," or equal.
2. V-1N: Sizes 4 through 12 inches, resilient wedge, 200-lb cold water, class 125 ANSI flange, NRS with 2-inch square operating nut, cast-iron body, SBR resilient seat on disc, o-ring stem seal, AWWA C509; epoxy-lined and coated in accordance with AWWA C550; Stockham "G-700-0," Waterous "Series 500," M&H "AWWA C509-306B," or equal.
3. V-1P: Sizes 4 through 12 inches, resilient wedge, 200-lb cold water, class 125 ANSI flange, NRS with hand wheel, cast-iron body, styrene-butadiene-rubber (SBR) resilient seat on disc, o-ring stem seal, AWWA C509; epoxy-lined and coated in accordance with AWWA C550; Stockham "G-700-0," Waterous "Series 500," M&H "AWWA C509-306B," or equal.

4. V-2Q: Sizes 2-1/2 through 12 inches, tested and listed or labeled by any nationally recognized testing laboratory (NRTL) recognized under 29 CFR 1910.7; IBBM, 175-lb cold water, class 125 ANSI flange, solid wedge, OS&Y, bronze stem; Mueller "A2073-6," American-Darling "55," or equal.

B. Check Valves:

1. V-50E: Sizes 2-1/2 through 12 inches, swing type, NRTL approved, IBBM, 175-lb cold water, class 125 ANSI flange, BB, for use in vertical or horizontal position, renewable composition disc and bronze seat ring; Stockham "G-940," American-Darling "52-SC," Mueller "A2122-6," or equal.
2. V-50P: Alarm check valve, sizes 4 through 8 inches, NRTL approved, 125-lb ASME B16.1 flange, 175-lb cold water; Grinnell "F200," Reliable "E," Viking "F-1," or equal.
3. V-50Q: Wafer check valve, sizes 4 through 8 inches, 175-lb cold water, NRTL approved, iron body, buna-n seat, spring loaded; Stockham "WG-990," ITT Kennedy, or equal.

2.2 HYDRANTS

A. Wet-Barrel Fire Hydrants (V-100B): 6-inch California-type fire hydrant with wet barrel, 175-lb working pressure, cast iron, bronze trim, 6-inch inside diameter (I.D.) waterway,

two 2-1/2 inch fire hose outlets, and one 4-1/2 inch lower steamer outlet each outlet with NSFHT (National Standard Fire Hose Thread) and independently valved with 1-1/8 inch pentagon operating nut on cap; 29-3/4 inch overall height from bottom of body flange; hydrant complete with 6-inch bury (length of bury to suit depth of water main connection as indicated on the drawings) with manufacturer's standard factory-applied primer; Rich "76," Logan "651," or equal. Substitutes shall also have dimensions identical to Rich "76."

B. Dry-Barrel Fire Hydrants (V-100W):

1. Hydrants shall be designed, manufactured, and tested in accordance with AWWA C502.
2. Hydrants shall be traffic-type with a replaceable breakable unit immediately above the ground line for minimizing repairs due to traffic damage.
3. Hydrants shall be of a dry-barrel configuration to prevent water loss due to traffic damage and freezing.
4. Hydrants shall be constructed such that the main valve closes with water pressure to assure no loss of water in the event of damage to the upper portion of the fire hydrant.
5. Main valve opening shall have a diameter of at least 5-1/4 inches to assure optimum flow.
6. Standpipe (hydrant barrel) inside diameter shall not be less than 7-1/4 inches.
7. Hydrant shall be of a "dry top" design with o-ring seals to ensure that the operating threads will be protected from water entry.
8. Hydrant operating nut shall turn LEFT to open in order to maintain uniformity with presently installed hydrants, and direction of OPEN shall be clearly marked at the top of the hydrant.
9. Operating and cap nuts shall be pentagon in shape; dimension shall be 1-1/2 inches point to flat (standard).
10. Hydrants shall have a 6-inch inlet of flanged design for ease of installation.
11. Hydrants shall have an automatic drain that is operated by the main valve rod and shall have two plugged drains in the shoe of the hydrants. These plugged drains shall be brass lined to prevent rusting.
12. Hydrants shall have two 2-1/2 inch nozzles having NST threads and one 4-1/2 inch pumper nozzle having NST threads. Provide the caps with rubber gaskets to prevent leakage; if nut design caps are supplied, they shall conform to item 9. Caps shall be equipped with stainless steel chains and pear links. Wire chains and cables are unacceptable. The minimum distance from the ground line to the center line of the lowest nozzle shall be 18 inches.
13. Hydrant nozzle section shall be able to rotate through 360 degrees with respect to the standpipe. Such rotation shall not place the operating rod in a position so as to obstruct the flow through any nozzle.
14. The fire hydrants shall be tagged with the bury length shown on the drawings.
15. The outside of the hydrant top section shall be painted with at least one coat of primer and one finished coat of industrial enamel, yellow in color to match existing hydrants in the system.
16. Hydrants with springs, toggles, and other excessive parts which may present expensive maintenance problems will not be considered.

17. Flow characteristics and friction loss through the hydrant shall not exceed AWWA C502.
18. Hydrants shall be Waterous Pacer "WB-67" or equal (no known equal).

C. Fire Hose Adapters (V-101C): 2-1/2 inch bronze, class 150 ANSI flange one end, male NSFHT other end, with cap and chain, to be assembled from the following components:

1. 2-1/2 inch class 150 ANSI threaded bronze flange
2. Bronze male hose nipple; one end 2-1/2 inch iron pipe thread, other end 2-1/2 inch NSFHT; Western Fire Equipment Co. "3A008," Potter-Roemer Inc. "146," Wilkirk Inc. "14-146," or equal
3. Bronze hose cap; Western Fire Equipment Co. "3A05," Potter-Roemer Inc. "126," Wilkirk Inc. "17-126," or equal
4. Bronze chain for attaching hose cap to hose nipple

D. Post Indicator Valves (PIV):

1. V-102A: Gate valve, 4 through 14 inches, indicator post type; NRTL approved; IBBM, 175-lb cold water, class 125 ANSI flange, double disc, NRS, with indicator post flange and 2-inch square operating nut, asphalt-varnish dipped; Clow "F-5722," Waterous Co. "series 300," or equal; for use with indicator post V-102B (specified below).
2. V-102B: Indicator post, adjustable type; NRTL approved; for use with indicator-post type gate valve V-102A (specified above); cast iron, 1-1/4 inch wrench nut; Clow "F-5750," Waterous Co. "A240," or equal. Specify valve size; lengths as required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to section 33 00 00 "Utility Distribution Systems" for installation.

END OF SECTION 33 12 00

SECTION 33 31 00
SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Non-pressure couplings.
3. Expansion joints and deflection fittings.
4. Cleanouts.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Expansion joints and deflection fittings.
2. Backwater valves.

1.4 INFORMATIONAL SUBMITTALS

A. Construction Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet (1:500) and to vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by CUSD or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify CUSD no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without CUSD written permission.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.2 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Alhambra foundry A-1241.
   b. Or equal

2. Description: ASTM A-48, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

4. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.3 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 3000 psi (27.6 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain if required.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel if required.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain if required.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel if required.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

E. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope shown on drawings unless otherwise indicated.
2. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
1. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC pipe fittings in sewer pipes at branches for cleanouts, and use PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, per details . Set with tops flush with above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.6 IDENTIFICATION

A. Comply with requirements in Section 31 20 00 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.7 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Fill sewer piping with water. Test with pressure of at least 10-foot (3-m) head of water, and maintain such pressure without leakage for at least 15 minutes.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
    b. Option: Test concrete gravity sewer piping according to ASTM C 924 (ASTM C 924M).

7. Manholes: Perform hydraulic test according to ASTM C 969 (ASTM C 969M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.8 CLEANING

A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION 333100

SECTION 33 41 00
STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Subcontract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Cleanouts.
3. Drains.
4. Catch basins.
5. Pipe outlets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

C.

1. Catch basins. Include plans, elevations, sections, details, frames, covers, and grates.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle catch basins according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by SCHOOL DISTRICT or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify SCHOOL DISTRICT no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without SCHOOL DISTRICT's written permission.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.2 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Alhambra Foundary
   b. Or equal

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Sewer Pipe Fitting and Riser to Cleanout: PVC pipe and fittings.
4. Description: PVC body with PVC threaded plug. Include PVC storm utility pipe fitting and riser to cleanout of same material as storm utility piping.

2.3 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.4 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Per ADA standards.

2.5 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to the National Stone, Sand & Gravel Association (NSSGA's) "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping with 36-inch (915-mm) minimum cover or per plan.
3. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use PVC pipe fittings in sewer pipes at branches for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B.

1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

C. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch (25 mm) above surrounding earth grade.

D. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 DRAIN INSTALLATION

A. Install type of drains in locations indicated on plans.

B. Fasten grates to drains if indicated.

C. Set drain frames and covers with tops flush with pavement surface.

D. Assemble trench sections with flanged joints.

3.6 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.9 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    b. Option: Test plastic piping according to ASTM F 1417.
    c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).

6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig (1035 kPa).

    a. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100