PROJECT MANUAL

Volume I of I

LOS ALAMITOS UNIFIED SCHOOL DISTRICT

LOS ALAMITOS HIGH SCHOOL GYMNASIUM

3591 W. Cerritos Avenue
Los Alamitos, CA 90720

A# 04- 121669
WD Project #21732

12.09.2023

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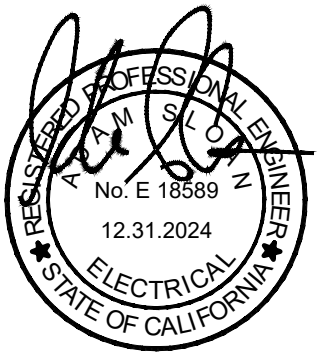
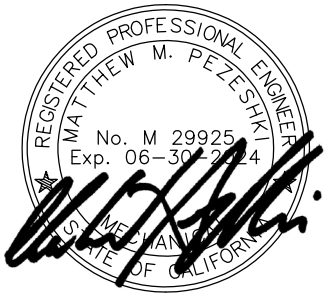
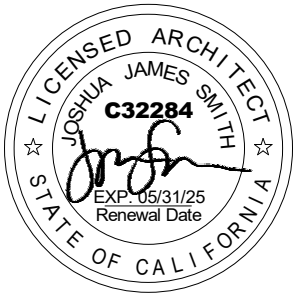
SECTION 00 01 07

SEALS PAGE







IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 04-121669 INC:

REVIEWED FOR

SS ☑ FLS ☑ ACS ☑

DATE: 08/21/2023

END OF SECTION

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SECTION 01 30 00
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A. General administrative requirements.
B. Preconstruction meeting.
C. Site mobilization meeting.
D. Progress meetings.
E. Preinstallation Conferences
F. Construction progress schedule.
G. Progress photographs.
H. Submittal Schedule
I. Submittals for review, information, and project closeout.
J. Requests for Interpretation (RFI) procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 33 00 - Submittal Proceedures
B. Section 01 60 00 - Product Requirements: General product requirements.
C. Section 01 63 00 - Product Substitution Procedures
D. Section 01 70 00 - Contract Closeout

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.
B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.

5. Submission of initial Submittal schedule.
6. Designation of personnel representing the parties to Contract, Fillmore USD and <1|A/E|>.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

A. Owner will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.

10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 PREINSTALLATION CONFERENCES

A. Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, and coordination with adjacent activities. Prepare agenda appropriate to Work.
   3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
   4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
   5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

3.05 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

A. Within 10 days after date established in Notice to Proceed, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.06 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work.

D. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification.

3.07 REQUESTS FOR INTERPRETATION (RFI)

A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.

b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to Owner.
3. Combine RFI and its attachments into a single PDF electronic file.

B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

C. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Highlight items requiring priority or expedited response.

F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to the complexity of the RFI.

G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith.

Identify the amended RFI with an R suffix to the original number.

2. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Coordinate with Contractor's construction schedule and schedule of values.
   2. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. Provide copies and distribute in accordance with Section 01 33 00 - Submittal Proceedures .

3.10 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 70 00 - Contract Closeout.
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.

D. Submit for Owner's benefit during and after project completion.

3.12 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Refer to Section 01 33 00 - Submittal Proceedures
   2. For product substitutions and for *Or Equal* products refer to Section 01 63 00 - Product Substitution Procedures.

3. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1. - GENERAL

1.01 SUMMARY

A. Submit to the Architect, progress schedule, application for payment, shop drawings, project data, and miscellaneous submittals required by the Contract Documents.

B. Related Requirements Specified Elsewhere:
   1. General Conditions
   2. Supplementary Conditions

C. Designate in a progress schedule, or in a separate coordinated schedule, the dates for submission and the dates reviewed shop drawings, and project data will be needed for each product.

1.02 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings, and product data prior to submission. Provide review stamp on submittals. See Example "A" form at the end of this section and General Conditions for specific requirements

B. Determine and Verify:
   1. Field measurements.
   2. Field construction criteria.
   3. Catalog numbers and similar data.
   4. Conformance with specifications.

C. Coordinate each submittal with requirements of the work and of the Contract documents.

D. Notify the Architect in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.

E. Do not begin fabrication or work, which requires submittals until return of submittals with Architect's approval.

1.03 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that requires sequential activity.
   2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
      a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

1.04 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the work or in the work of any other contractor.

B. Schedule submissions for the Architect to receive them at least 10 working days before dates reviewed submittals will be needed.

C. Provide Electronic Submittals for:
   1. Shop Drawings
   2. Product Data
   3. Miscellaneous paper submittals required by the Contract Documents

D. Accompany submittals with transmittal form provided by Architect, (sample provided at end of this section) in duplicate, containing:
   1. Date.

2. Project title and number.
3. Contractor's name and address.
4. The number of each shop drawing and product data submitted.
5. Notification of deviations from Contract Documents.
6. Other pertinent data.

E. Submittals to include:
1. Date and revision dates.
2. Project title and number.
3. The names of:
a. Architect/Engineer.
b. Contractor.
c. Subcontractor.
d. Supplier.
e. Manufacturer.
f. Separate detailer when pertinent.
4. Identification of product or material.
5. Relation to adjacent materials.
6. Field dimensions, clearly identified as such.
7. Specification section number.
8. Applicable standards, such as ASTM number or Federal Specification.
9. A blank space, 8" x 3", for the Contractor and Architect stamps.
10. Identification of deviations from Contract Documents.
11. Contractor's stamp, signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents. Sample text of Contractors Review Stamp is provided at the end of this Section, identified as "Example 'A'."

F. All items required to be submitted for review are to bear the review stamp of the Contractor certifying that he has reviewed the content of the submittal, that the submittal complies with the Contract Documents and contains no unauthorized substitutions.

G. The Architect reserves the right to reject and return, unreviewed, all submittals not bearing the review stamp of the Contractor; poor quality or incomplete Shop Drawings and all submittal which do not meet the requirements of this Section and General Conditions Article 23, Shop Drawings, Product Data, and Samples. Construction delays resulting from returned, incomplete or incorrect submittals are the responsibility of the Contractor and not the Architect

1.05 RESUBMISSION REQUIREMENTS

A. Shop Drawings:
1. Revise initial drawings as required and resubmit as specified for initial submittal.
2. Indicate on drawings any changes, which have been made other than those, requested by Architect.
3. Product Data: Submit new data as required for initial submittal.

1.06 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Critical-Path Schedule: Prepare a fully developed, Critical Path Method type Contractor's construction schedule. Submit within 7 days after the date established for "Award of Contract". Submit Schedule in compliance with General Conditions Article 32, Progress Schedule.
1. Provide a separate time for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
2. Within each time period indicate estimated completion percentage in 10 percent increments. As Work progresses, indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.

5. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

1.07 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
   1. Dimensions.
   2. Identification of products and materials included.
   3. Compliance with specified standards.
   4. Notation of coordination requirements.
   5. Notation of dimensions established by field measurement.
   6. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 30" x 42".
   7. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

C. Electronic documents:
   1. Small sheet (8-1/2" x 11" and 11" x 17"), submit electronic copy in PDF format; an electronically-markekd up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

1.08 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
   1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information. Delete information, which is not applicable.
   2. Submittals: Submit 2 copies of each required submittal; submit 4 copies where required for maintenance manuals. The Architect will retain one, and will return the other marked with action taken and corrections or modifications required.
      a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
   3. Distribution: Furnish copies of approved submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
      a. Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession. Do not permit use of unmarked _copies of Product Data in connection with construction.

1.09 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.
   1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following:
      a. Generic description of the Sample.

b. Sample source.
c. Product name or name of manufacturer.
d. Compliance with recognized standards.
e. Availability and delivery time.

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
   a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
   b. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
4. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal. Sample sets may be used to obtain final acceptance of the construction associated with each set.
5. Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.
   a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.10 ARCHITECT'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
   1. Compliance with specified characteristics is the Contractor's responsibility.

1.11 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Contractor is to distribute reproductions of Shop Drawings and copies of Product Data which carry the ArchitecUEngineer stamp to:
   1. Job site file.
   2. Record Documents file.
   3. Other affected contractors.
   4. Subcontractors.
   5. Supplier or Fabricator.
   6. Owner's Inspector.

1.12 TIMING OF SUBMITTALS

A. Make submittals far enough in advance of scheduled dates for installation to provide the required time for reviews, for securing necessary approvals of DSA if required, for possible revision and resubmittals, for placing orders and securing delivery.

B. Delays: Cost of delays occasioned by tardiness of Contractor submittals may be back charged as necessary and is not to be borne by the School District or Architect.

PART 2. PRODUCTS

NOT APPLICABLE

PART 3. EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General Quality Assurance.
   1. Workmanship.
   2. Tolerances
      a. References.
      b. Mockup.
      c. Manufacturers' Field Services and Reports.

B. RELATED SECTIONS
   1. Section 01 30 00 - Administrative Requirements
   2. Section 01 41 00 - Testing and Inspections.
   3. Section 01 63 00 - Product Substitution Procedures
   4. Section 01 65 00 - Starting of Systems.

C. WORKMANSHIP
   1. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
      a. Comply with manufacturers' instructions, in full detail, including each step in sequence.
      b. Should manufacturers' instructions conflict with Project Documents, request clarification from Architect before proceeding.
      c. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
      d. Perform work by persons qualified to produce workmanship of specified quality.
      e. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

D. TOLERANCES
   1. Monitor tolerance control of installed Products to produce acceptable Work. Do not permit tolerances to accumulate to result in unacceptable field conditions.
   2. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Project Documents, request clarification from Architect before proceeding.
   3. Adjust Products to appropriate dimensions; position before securing Products in place.

E. MOCK-UP
   1. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
   2. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
   3. Accepted mock-ups shall be representative of the quality required for the Work.
      a. Here mock-up has been accepted by Architect and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

F. MANUFACTURERS' FIELD SERVICES AND REPORTS
   1. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
      a. Manufacturers' representative shall be subject to approval of Architect.
      b. Manufacturers' representative shall submit a written report of observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

c. Submit report in duplicate within 30 days of observation to Architect for information.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 41 00
TESTING AND INSPECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selection and payment.

B. Contractor submittals.

C. Laboratory responsibilities.

D. Laboratory reports.

E. Limits on testing laboratory authority.

F. Contractor responsibilities.

G. Schedule of tests and inspections.

1.02 RELATED SECTIONS

A. Section 01 33 00 - Submittal Proceedures: Manufacturer's certificates.

B. Section 01 65 00 - Starting of Systems

C. Section 01 70 00 - Contract Closeout: Project Record Documents.

D. Individual Specification Sections and Drawings: Inspections and tests required, and standards for testing.

1.03 REFERENCES

A. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete.

B. ASTM C31 - Making and Curing Concrete Test Specimens in the Field.

C. ASTM C88 - Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate.

D. ASTM C140 - Sampling and Testing Concrete Masonry Units.

E. ASTM C426 - Standard Test Method for Drying Shrinkage of Concrete Block.

F. ASTM D1556 - Standard Test for Density of Soil in Place by the Sand-Cone Method.

G. AWS D1.1 - Structural Welding Code - Steel.

H. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

I. T24, CCR - Title 24, California Code of Regulations.

J. CBC - California Building Code, Volume II - Standards

1.04 SELECTION AND PAYMENT

A. Owner will employ and pay for services of an independent testing laboratory to perform specified testing and review and comment upon welding procedures. Owner will employ and pay for services of a DSA certified inspector to perform specified inspections. The Contractor shall not pay for any laboratory testing or inspections to testing laboratory or inspector.

B. Testing Laboratory and inspector will be approved by the Division of the State Architect, per T24, CCR, Part I, Section 4-335. Testing lab must have DSA LEA acceptance.

C. Employment of testing laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Costs of initial testing and inspection, except as specifically modified herein, or specified otherwise in technical sections, will be paid for by the District, providing such testing and inspection indicates compliance with Contract Documents. Initial tests and inspections are defined as the first tests and inspections as hereinafter specified. The District may be reimbursed by the Contractor for testing costs under the Contract conditions contained herein, and in the General Conditions.

E. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for re-testing and re-inspection will be paid by the

District and deducted from payments to Contractor.

F. Additional tests and inspections not herein specified but requested by District or Architect, will be paid for by the District, unless results of such tests and inspections indicate non- compliance with Contract Documents, in which case the District will pay all costs for initial testing as well as re-testing and re-inspection and deduct such costs from payments to Contractor.

G. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply will be paid by District and deducted from payments to the Contractor.

H. Costs for work required to correct deficiencies shall be borne by the Contractor.

I. Cost of testing, which is required solely for the convenience of Contractor in his scheduling and performance of work, shall be borne by the Contractor. Overtime costs shall be borne by the Contractor when work is performed during hours other than normal workweek and laboratory inspection is required. District will pay normal cost of laboratory inspection, and Contractor shall pay that portion of laboratory inspection cost due to overtime.

J. Testing Laboratory will separate and identify on the invoices, the costs covering all testing and inspections that are to be deducted from payments to the Contractor, as specified above.

K. Testing Laboratory will furnish to District a cost estimate breakdown covering initial tests and inspections required by Contract Documents. Estimate will include number of tests, man- hours required for tests, field and plant inspections, travel time and costs.

L. The cost of shop fabrication inspection and material testing outside the State of California or outside of a 150-mile radius of the job site shall be paid for by the District and deducted from payments to the Contractor.

1.05 TESTING LABORATORY

A. Testing and inspection services shall be performed by an independent testing laboratory, and shall be in accordance with requirements of Title 24, CCR, and the requirements specified herein. The duties of the Testing service are described in T24, CCR, Part I, Article 4-335.

B. Testing and inspection services shall verify that work incorporated into the project meets the requirements of the Contract Documents.

C. In general, tests and inspections for structural materials shall include all items listed on the Structural Tests and Inspections list for this project as prepared and distributed by the Architect, and approved by the Division of the State Architect.

D. Test reports shall be signed by a Registered Civil Engineer licensed in the State of California.

1.06 TESTS

A. Selection of the material to be tested shall be by the laboratory or the District's representative and not by the Contractor.

B. The Contractor shall notify the District's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract be tested, in order that the District may arrange for the testing of same at the source of supply.

C. Any material shipped by the Contractor from the source of supply before having satisfactorily passed such testing and inspection or before the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.

1.07 TEST AND INSPECTION REPORTS

A. Testing Laboratory will certify in writing that all work specified or required to be tested and inspected conforms to or does not conform to drawings, specifications and applicable building codes.

B. The Testing Laboratory will make the following distribution of all test and inspections reports within 14 days of the date of the test:

1. Project Inspector of Record 1
2. Specialty Inspectors 1

3.	Architect	2
4.	Structural Engineer	1
5.	Contractor	1
6.	School District/Construction Manager	2
7.	Division of the State Architect	1

C. One copy of all test reports shall be forwarded to the Division of the State Architect within 14 days of the date of the test by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory.
   1. Samples taken but not tested shall also be reported.
   2. Records of special sampling operations as required shall also be reported.
   3. The reports shall indicate that the material or materials were sampled and tested in accordance with the requirements of T24, CCR and with the approved specifications.
   4. Test reports shall show the specified design strength.
   5. Test reports shall also state definitely whether or not the material or materials tested comply with requirements.

1.08 VERIFICATION OF TEST REPORTS

A. Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering all of the tests which are required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on that project is suspended, covering the tests up to that time, and at the completion of the project, covering all tests.

1.09 REPORTING TEST FAILURES

A. Immediately upon Testing Laboratory determination of a test failure, the Laboratory will telephone the results of test to Architect. On the same day, Laboratory will send written test results to those named on above distribution list.

1.10 AVAILABILITY OF SAMPLES

A. Contractor shall make materials required for testing available to Laboratory and assist in acquiring these materials as directed by the District's Inspector. The samples shall be taken under the immediate direction and supervision of the Testing Laboratory.

B. If work, which is required to be tested or inspected, is covered up without prior notice or approval, such work may be uncovered at the discretion of Architect at no additional cost to the District. Refer to Article 1.04 of this section.

C. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of three working days in advance of all required tests, and a minimum of three working days in advance of all required inspections. Extra laboratory expenses resulting from failure to notify the Laboratory shall be paid for by the District and deducted from payments to the Contractor.

D. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection. Charges due to insufficient advance notice of cancellations or time extensions shall be paid for by the District and deducted from payments to the Contractor.

1.11 REMOVAL OF MATERIALS

A. Unless otherwise directed, materials not conforming to the requirements of Contract Documents shall e promptly removed from the job site.

1.12 INSPECTION BY THE DISTRICT

A. The District and his representatives shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

B. B. The District shall have the right to reject materials and workmanship that are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the District. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the District

may correct such conditions and deduct the costs from payments to the Contractor.

C. Should it be considered necessary or advisable by the District at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to fault of the Contractor or his subcontractor, the Contractor shall bear the expense of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be reimbursed to the Contractor by the District.

1.13 CONTRACTOR RESPONSIBILITIES

A. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

B. Verify that all required examinations and test samples have been made prior to covering work.

C. Provide incidental labor and facilities:
   1. To provide access to Work to be tested,
   2. To obtain and handle samples at the site or at source of Products to be tested,
   3. To facilitate tests and inspections,
   4. To provide storage and curing of test samples.

1.14 DISTRICT'S INSPECTOR

A. A DSA Certified Inspector employed by the District in accordance with the requirements of T24, CCR, will be assigned to the work. The duties of the Inspector are described in T24, CCR, Part I, Article 4-333 & Article 4-342.

B. Special Inspectors may be employed by the District as required by T24, CCR. They shall be afforded every right of access and cooperation required of the Contractor for the Inspector of Record.

C. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining the information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

D. Contractor shall keep Inspector advised at all times of all work in advance of its execution. Such advance notice shall be in conformance with the time limitations established in the project manual and CCR, T24. The minimum notice shall be 24 hours in advance of performance of the work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SCHEDULE OF TESTS AND INSPECTIONS

A. Provide reference to the approved DSA 103 for complete listing structural test and special inspections.

B. Tests and inspections for the following will be required, as applicable. Section references are to T24 CCR, Part 2.

C. Concrete
   1. Concrete Mix Design:
      a. The District will pay for the sampling of aggregate and preparation of mix design one time for each strength and/or aggregate size specified. Testing cost for additional mix designs will be paid for by the District and deducted from payments to the Contractor. The District will pay continuous batch plant inspection and all tests of materials, but Contractor payments will be reduced accordingly for all tests performed on materials that do not meet specification requirements.
      b. Test concrete aggregates for mix design only.

c. Deliver samples of approved aggregate to job for comparison with material delivered, if job mixed concrete is used.
d. Test suitability of aggregates in accordance with ASTM C88 if material is under suspicion and if so directed by Architect or Division of the State Architect.

2. If compressive test of core specimens fail to show compressive strength specified, remove and replace concrete or adequately strengthen in a manner acceptable to Architect and Division of the State Architect.
3. Certification shall be made before a Notary Public that tests, the results of which shall be shown, were made in accordance with provisions of Rules and Regulations of the Division of the State Architect.
4. Make all tests, take samples, and prepare samples in accordance with the latest standards adopted by American Society for Testing and Materials, or ASTM.
5. Concrete mixed at certified automatic concrete batch plants shall have quality control as follows:
   a. Laboratory designed mixes using adequate cement factors.
   b. The testing laboratory shall perform continuous batch plant inspection.
6. Concrete mixed at non-certified plants shall have quality control as follows:
   a. Laboratory designed mixes using adequate cement factors.
   b. The testing laboratory shall perform continuous batch plant inspection.
   c. Measure all water, including wash water, so total on truck does not exceed 95 percent of maximum allowed in mix design.
   d. Legible, certified weighmaster's certificates shall be provided to the Project Inspector for all structural and nonstructural concrete, in accordance with the requirements of the Division of the State Architect.
   e. At end of job, furnish affidavit to Division of the State Architect on form SSS 411-8, certifying that all concrete furnished conformed in every particular, to requirements of T24, CCR, and approved Contract Documents.
7. Continuous batch plant inspection requirement may be waived by the Architect in accordance with Section 1705A.3.3. Such waiver shall be in writing, with approval of the Division of the State Architect.
8. Reinforcing Steel:
   a. Tests shall be performed before the delivery of steel to job site. Steel not meeting specifications shall not be shipped to the job.
   b. Testing procedure shall conform to ASTM A615.
   c. Sample at the place of distribution, before shipment: Make one tensile test and one bending test from samples out of 10 tons, or fraction thereof, of each size and kind of reinforcing steel, where taken from bundles as delivered from the mill and properly identified as to heat number. Mill analysis shall accompany report.
   d. Where identification number cannot be ascertained, or where random samples are taken, make one series of tests from each 2-1/2 ton, or fraction thereof, of each size and kind of reinforcing steel. Tests on unidentified reinforcing steel will be paid for by the District and deducted from payments to the Contractor.
   e. Samples shall include not fewer than two pieces, each 18 inches long, of each size and kind of reinforcing steel.
   f. Inspection of welding of reinforcing steel shall be done by a specially qualified laboratory inspector and tested in accordance with AWS D1.4
   g. District's Inspector will inspect all reinforcement for concrete work for size, dimensions, locations and proper placement. Inspector shall be present during welding of al reinforcing steel.
9. Inspection by District’s Inspector:
   a. Placement of reinforcing steel and concrete at job.
   b. Obtain load ticket and identify mix before accepting load. Keep daily record of pour, identifying each truckload, time of receipt, and location of concrete in structure. Keep record until completion of structure and have available for inspection. Forward two copies of weighmaster’s certificate to the Division of the State Architect immediately.

c. During progress of work, samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards (38.2 meters squared) of concrete, or not less than once for each 2,000 square feet (186 meters squared) of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concerte work or whenever the mix or aggregate is changed.
d. Each sample shall be taken in three parts from the same batch, one part to be tested at 7 days, and the others to be tested at 28 days.
e. Make and store cylinders according to ASTM C31.
f. Deliver cylinders to laboratory or store cylinders in a suitable protected environment for pick up by laboratory personnel.
g. Make a slump test of wet concrete according to ASTM C143, at least at the same frequency that the test cylinders are taken.

10. Concrete materials shall be tested to conform to the following:
    a. General Testing Requirements: Sections 1903A, 1905A, 1913A.1, ACI318, Ch. 5.
    b. Portland Cement:
    c. Concrete Aggregates: Section 1903A.6.
    d. Reinforcing Bars, Tendons, Pipes, or Tubing: Section 1913A.2.
    e. Admixtures: Section 1903A, 1904A.
11. Mixed concrete quality shall be tested and inspected to conform to the following:
    a. Batch Plant Inspection: Section 1705A.3.2.
    b. Proportions of Concrete: Section 1903A, 1904A.
    c. Strength Tests of Concrete: ACI 318, Ch. 5.
12. Placement of concrete shall be inspected to conform to the following:
    a. Job Site Inspection: Section 1705A.3.5, 1705A.3.6.
    b. Welding of Reinforcing Bars: Section 1705A.2.2, 1705A.2.2.1.2.
13. Placement of post-installed concrete anchors.
    a. Expansion and epoxy anchors, shot pins: Section 1913A.7.

D. Lightweight Metals
1. Certification that the alloys and tempers of materials used in the work are as called for in Contract Documents shall be provided to the Project Inspector. Certification shall be furnished by an independent testing laboratory approved by the Division of the State Architect and shall conform to CBC Ch. 17A, as for steel, per CBC Ch. 20.
2. Each member shall be positively identified and marked to indicate alloy and temper, as per Section 2210A.
3. The Project Inspector shall inspect all fabrication and erection, as required for structural steel.
4. Welding inspection shall be as required for steel fabrication.

E. Gypsum Board and Plaster:
1. Testing of materials for conformance with reference standards and the requirements of the Contract Documents, shall be performed by the Testing Laboratory if required by the Division of the State Architect or as directed by the Architect.
2. The Project Inspector shall inspect the attachment of all lath and gypsum plaster prior to covering and finishing.

F. Fire-Resistive Patching of Penetrations in Fire-Rated Assemblies:
1. Inspection by District’s Inspector:
    a. Inspector will inspect all locations of Fire-Resistive Patching for conformance with listed requirements of Underwriter’s Laboratories.
    b. Contractor shall not conceal areas patched, until such time as the Inspector accepts the work as conforming to the Contract requirements.

G. All tests and/or inspections required on the following page(s), Form DSA-103-1, Structural Test & Inspections.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1. - GENERAL

1.01 SUMMARY

A. THIS SECTION ESTABLISHES PROCEDURES FOR SPECIFIED PRODUCT OPTIONS.

1.02 RELATED SECTIONS

A. Section 01 30 00 - Administrative Requirements

B. Section 01 63 00 - Product Substitution Procedures

1.03 PRODUCT OPTIONS

A. Where product options are included in the specifications sections and are specified by naming more than one, or several acceptable products or manufacturers, select any product or manufacturer listed.

B. Where more than one manufacturer or product is listed in the specifications and only one manufacturer or product is specified in detail with model numbers and features, the one specified in detail shall be considered the standard of quality required for all manufacturers or products listed.

1. Where product options are included in the specifications and they are followed by an "or equal " or "approved equal" or equal meeting a specified standard, review and approval by the Architect and School District is required for Contractor proposed equal items. Procedures specified in Section 01 63 00 are to be followed.
2. For items specified only by Reference Standards, select any item meeting standards.
3. Performance Specifications: For items specified by performance requirements, select any item meeting the performance standards specified.
4. Descriptive Specifications: When specifications describe a product or assembly, listing exact components and characteristics, without the use of a brand or trade name, provide a product or assembly that contains the components and characteristics specified.
5. Compliance with Standards Specifications: When specifications only require compliance with a Code, Regulation or Voluntary Standard, Provide products that comply with the specified Codes, Regulations or Standards.
6. Submit request, as required for substitution, for any item or manufacturer not specifically named in the specifications per the requirements of section 01 63 00 - Product Substitution Requirements.
    a. Architect and School District will determine acceptability of proposed substitutions.

PART 2. - PRODUCTS

NOT APPLICABLE

PART 3. - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 63 00
PRODUCT SUBSTITUTION PROCEDURES

PART 1. GENERAL

1.01 SECTION INCLUDES

A. This Section establishes procedures for Contractor submittal of substitutions.

B. This Section provides procedures for review and compliance with Public Contract Code Section 3400 for the “or equal” clause allowing bidders to furnish any equal material, product, thing or service. Or equal items proposed by bidders are considered substitutions and are subject to approval of the Architect and School District. Burden of proof for “Or Equals is the responsibility of the Contractor.

C. The intent of this section is to insure that proposed substitutions exceed or equal the quality of the specified products and are furnished and installed in accordance with the Contract Documents.

1.02 RELATED SECTIONS

A. General and Supplementary Conditions

B. Section 01 60 00 - Product Requirements

1.03 SUBSTITUTIONS

A. Substitution requests are to be submitted by General Contractors only. Requests submitted by Subcontractors, Material Suppliers, Manufacturers and other interested parties, other than General Contractors, will not be considered. Submit requests on the attached FORM “A”, SUBSTITUTION REQUEST FORM at the end of this section.

B. Comply with provisions of Articles for Substitutions in the General Conditions and any modifications to General Conditions provided in the Supplementary Conditions.

C. Tabulate products by specification section number and title.

D. Submit separate request for each substitution. In addition to “FORM A”, SUBSTITUTION REQUEST FORM”, support each request with a side by side itemized comparison of the proposed substitution with product specified; including significant variations. Substitution requests without side by side itemized comparisons will not be reviewed, not accepted. Support each request with:
   1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
      a. Product identification, including manufacturer's name and address.
      b. Manufacturer's literature; identify:
         1) Product description.
         2) Reference standards.
         3) Performance and test data.
         4) Fire resistance and fire ratings.
      c. Samples, as applicable.
      d. Name and address of similar projects on which product has been used, and date of each installation.
   2. List significant variations.
   3. Any effect the substitution may have on other trade contracts.
   4. List of changes required in other work or products.
   5. Accurate cost data comparing proposed substitution with product specified.
      a. Amount of any change in cost.
   6. Designation of required license fees or royalties.
   7. Designation of availability of maintenance services, sources of replacement materials.
   8. Comparison of physical size and weight with product specified.
   9. Comparison of physical shape and available finishes.

E. Substitutions will not be considered for acceptance when:

1. They are indicated or implied on shop drawings or product data submittals and where not approved in compliance with the General Conditions and this section.
2. They are requested after the Contract has been executed.
3. Substitution request procedures included in this Section and in the General and Supplementary Conditions are not complied with by the Contractor.
4. The School District has determined that compatibility, standardization, technological sophistication, service and uniformity are necessary with regard to technological and certain safety items across the Schools in the District.

F. Substitute products shall not be installed in the construction without written acceptance of the Architect and School District.

G. Architect and School District will determine acceptability of proposed substitutions prior to awarding of the Contract. Substitutions may be approved after award of the contract only where the following conditions exist.
1. Specified item has been discontinued or is not unavailable to meet project schedule.
2. The School District requested the Substitution.
3. Substitution will reduce the Contract Amount and Contract Time (Credit Back to the District) without reducing quality.

1.04 CONTRACTOR'S SUBSTITUTION CERTIFICATION

A. In making formal request for substitution contractor certifies that:
1. He has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
2. He will provide same warranties or bonds for substitution as for product specified.
3. He will coordinate installation of accepted substitution into the work, and will make such changes as may be required for the work to be complete in all respects including modification of the work of other trades.
4. He waives claims for additional costs caused by substitution which may subsequently become apparent.
5. Substituted material is similar in physical appearance, size and weight and will install with the same opening and attachments.
6. Substituted material has the same or better fire rating and fire resistive qualities, including flame spread, smoke developed, UL tested and listing.

1.05 ARCHITECT'S DUTIES

A. Review contractor's request for substitutions with reasonable promptness.

B. Consult with District and provide notification to contractor, in writing, of decision to accept or reject requested substitution.

1.06 AVAILABILITY OF SPECIFIED ITEMS

A. Verify prior to bidding that all specified and substituted items will be available in time for installation during orderly and timely progress of the work.

B. In the event specified items will not be available, notify the Architect prior to receipt of bids.

C. Cost of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the Architect or School District.

1.07 SUBSTITUTION WARRANTY REQUIREMENTS

A. Submit with the substitution request an executed Substitution Warranty. The Form is provided at the end of this Section. This form shall apply to substitutions submitted for acceptance prior to bid, prior to award of contract and for substitutions required after contract has been executed.

B. The Contractor is to warrant, in writing, that the substituted items are to perform as specified, and assume complete responsibility for the same. This includes responsibility and costs required for modifications to building, other materials, or equipment, and any additional coordination with work of other trades. Testing, of Substitution proposed, if required or

requested by the Architect or School District shall be paid for by the Contractor.

C. Sample text of SUBSTITUTION WARRANTY is provided at the end of this Section, identified as Example "B".

PART 2. PRODUCTS

NOT APPLICABLE

PART 3. EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 65 00
STARTING OF SYSTEMS

PART 1 GENERAL

SECTION INCLUDES

2.01 STARTING SYSTEMS.

A. Demonstration and instructions.

B. Testing, adjusting, and balancing.

C. RELATED SECTIONS
   1. Section 01 40 00 - Quality Control: Manufacturers field reports.
      a. Section 01 70 00 - Execution and Closeout Requirements: System operation and maintenance data and extra materials.

D. STARTING SYSTEMS
   1. Coordinate schedule for start-up of various equipment and systems.
      a. Notify Architect and Owner seven days prior to start-up of each item.
      b. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions that may cause damage.
      c. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
      d. Verify wiring and support components for equipment are complete and tested.
      e. Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions.
      f. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
      g. Submit a written report in accordance with Section 01400 that equipment or system has been properly installed and is functioning correctly.

E. DEMONSTRATION AND INSTRUCTIONS
   1. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.
      a. Demonstrate Project equipment and instruct in a classroom environment located at Owner's premises and instructed by a qualified manufacturers' representative who is knowledgeable about the equipment.
         1) C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
         2) Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
         3) Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time at equipment location.
         4) Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
      b. The amount of time required for instruction on each item of equipment and system is that specified in individual sections. Allow additional time as required to ensure Owner's representative understands all aspects of operation.
      c. TESTING, ADJUSTING, AND BALANCING
      d. Owner will appoint and employ services of an independent firm to perform testing, adjusting, and balancing. Contractor shall pay for services.
      e. The independent firm will perform services specified in Division 15.
      f. Reports will be submitted by the independent firm to the Architect indicating observations and results of tests and indicating compliance or non-compliance with

the requirements of the Contract Documents.

PART 2 PRODUCTS

3.01 NOT USED

PART 3 EXECUTION

4.01 NOT USED

END OF SECTION

SECTION 01 70 00
CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Closeout Procedures.

B. Final Cleaning.

C. Adjusting.

D. Observation of Completed Work

E. Project Record Documents.

F. Operation and Maintenance Data.

G. Warranties.

H. Spare Parts and Maintenance Materials.

1.02 CLOSEOUT PROCEDURES

A. When work is complete, submit written certification that Project Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Project Documents and ready for Inspector, District, and Architect review. Certification shall request final inspection by District.

B. Submit the following:
   1. Division of the State Architect, Verified Report, DSA-6, to the Architect, in duplicate.
   2. Close-out submittals as required by State and local agencies.
   3. Close-out submittals as required in individual specification sections.
   4. Completed Record Drawings.

1.03 REQUIREMENTS PREPARATORY TO COMPLETION

A. All temporary facilities and utilities shall be removed from the site.

B. The buildings and site shall be thoroughly cleaned as specified in this Section.

C. All plumbing and mechanical equipment shall operate quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration. Provide additional brackets, bracing, water hammer arrestors, or other methods to prevent objectionable noise or vibration. All systems shall operate without humming, surging, or rapid cycling.

D. All operating instructions for equipment shall be properly mounted and posted as specified in their respective sections.

E. Record (As-built) drawings shall be completed, signed, endorsed by the Inspector, and submitted to the Architect as specified herein.

F. The Material and Equipment maintenance instructions, as specified in the body of the Specifications, shall be submitted to the Architect.

G. All guarantees and warranties shall be submitted to the Architect.

H. All tools, which are a permanent part of equipment installed in the Work, shall be delivered to the District.

I. All keys, construction and permanent, properly identified shall be delivered to the District.

J. Contractor shall make final gas, water, waste, vent and electrical connections.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final project assessment. Employ skilled workmen experienced in cleaning construction materials.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft

surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Replace filters of mechanical equipment and any other filter installations performed as a part of the work.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

H. Wash and shine glazing and mirrors.

I. Polish glossy surfaces to a clear shine.

J. Vacuum all carpet.

K. Dust and damp mop all tile and resilient flooring.

1.05 ADJUSTING

A. Adjust operating products, systems, and equipment to ensure smooth and unhindered operation.

1.06 OBSERVATION OF COMPLETED WORK

A. When the Work is complete, and after all requirements preparatory to Completion have been performed as herein specified, Contractor shall notify the Architect in writing.

B. When requested by the District or Architect, the Contractor (and subcontractors as required by District or Architect), shall accompany the District and/or Architect on a tour of the Work.

C. If corrective work is identified, the Contractor may be provided with a “punch-list” identifying work that is incomplete and/or in need of correction. A “punch-list” shall not relieve the Contractor of any requirement of the Project Documents, nor shall such a list be considered to be all-inclusive of remaining work. The Contractor is responsible for completing all work required by the Project Documents, including all incomplete and corrective work, within the time requirements of the Contract.

D. If a “punch-list” or other notice of correction is issued to the Contractor, Contractor shall notify the Architect in writing, when all such work is complete. Contractor shall include with the written notification, a copy of all punch-lists issued to him. Each punch-list item shall be annotated with the construction superintendent’s initials, and the date that the item was observed by him to have been completed. The Contractor shall reimburse all costs incurred by the District, Architect, or Architect’s consultants, associated with reviewing incomplete or corrective work of the Contractor.

1.07 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set each of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract including, but not limited to, all RFI’s, CCD’s and CO’s.
   5. Reviewed Shop Drawings, Product Data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress. Do not permanently conceal any work until required information has been recorded.

E. Specifications: Legibly mark and record at each Product section description of actual Products 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 modifications.

F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish main floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Include all plumbing systems, fire protection systems, and electrical systems. For gravity flow lines such as sewers and storm drains, locate all cleanouts, and indicate invert elevations at building lines, changes in direction, intersections, and property lines.
5. Field changes of dimension and detail.
6. Details not on original Contract Drawings.

G. Methods of documenting changes:
1. Make reproducible transparencies of the Contract Drawings, and a reproducible copy of the Project Manual, all Addenda, Change Orders, and other Contract Documents.
2. Legibly mark documents with permanent ink; color code as appropriate to separate various types of work.
3. Provide all required data for Inspector verification prior to closing in concealed work.
4. Make all changes, corrections, deletions, or additions on transparencies by a competent draftsman.
5. The construction superintendent shall endorse the transparencies certifying the record drawings are an accurate illustration of the completed Work.

H. Remove Architect title block and all registration seals from all documents.

I. Submit documents to Architect prior to final Application for Payment.

1.08 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11-inch text pages, three ring (D shape) side binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project. Include subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 30-pound white paper, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
a. Significant design criteria.
b. List of equipment.
c. Parts list for each component.
d. Operating instructions.
e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
a. Shop drawings and product data.
b. Air and water balance reports.
c. Certificates.

d. Photocopies of warranties and bonds.

E. Data specified in Article 1.07 D above shall incorporate the following:
1. Manufacturer's Manuals: Complete installation, operation, maintenance and service manuals, and printed instructions and parts lists for all materials and equipment where such printed matter is regularly available from the manufacturer. This includes, but is not limited to such service manuals as may be sold by the manufacturer covering the operation and maintenance of his items, and complete replacement parts lists sufficiently detailed for parts replacement ordering to manufacturer. Bound publications need not be assembled in binders.
2. Equipment Nameplate Data: A typewritten list of all mechanical and electrical equipment showing all equipment nameplate data exactly. Identify equipment by means of names, symbols, and numbers used in the contract documents.
3. System Operating Instructions: Typewritten instructions covering operation of the entire system as installed (not duplicating manufacturer's instructions for operating individual components). Include schematic flow and control diagrams as appropriate and show or list valves, control elements, and equipment components using identification symbols and numbers. List rooms, area of equipment served, and show proper settings for valves, controls and switches.
4. System Maintenance Instructions: Typewritten instructions covering routine maintenance of system. List each item of equipment requiring inspection, lubrication, or service and briefly describe such maintenance, including types of lubricants and frequency of service. It is not intended that these instructions duplicate manufacturer's detailed instructions. Give name, address and phone number ofnearest firm authorized or qualified to service equipment or provide parts.

F. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.

G. Submit two sets of revised final volumes, within 10 days after final inspection.

H. Wall-Mounted Data: Frame one set of typewritten system instructions and diagrams as required under Paragraph 3 and 4 above, covered with glass and mounted in locations as directed by the District. This set of instruction is in addition to those required herein before.

1.09 WARRANTIES

A. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

B. Provide Table of Contents and assemble in three ring (D-shape) side ring binder with durable plastic cover.

C. Name District as the beneficiary. In addition, for all equipment and machinery, or components thereof, bearing a manufacturer's warranty that extends for a longer time period than the Contractor's warranty, secure and deliver the manufacturer's warranties in the same manner.

D. Submit prior to final inspection.

E. Form of Warranty: Written warranties, except manufacturers' standard printed warranties, shall be on the Contractor's, subcontractor's, material suppliers', or manufacturer's own letterhead, addressed to the District. All warranties shall be submitted in duplicate, and in the form shown on the following page, modified as approved to suit the conditions pertaining to the warranty.

F. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.10 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMERY

A. Surveying requirements for the work

1.02 RELATED SECTIONS

A. Section 31 22 00 - Grading

B. Section 31 10 00 - Site Clearing

C. Section 32 12 16 - Asphalt Concrete Pavement

D. Section 32 13 13 - Site Concrete Pavement

E. Section 33 40 00 - Storm Drainage System

PART 2 - PRODUCTS

2.01 SUBMITTALS

A. Submit the name and adress of the state of California licensed surveyor to CMR, Architect, and Owner including any changes as they may occur.

B. Submit to Owner, CMR, and Architect copies of cut sheets, coordinate plots, data collector printouts, and other documentation as available to verify completeness and/or accuracy of field surveying work.

C. Statement of Compliance: Submit a statement of certification signed and sealed by Surveyor, counter-signed by Contractor indicating compliance with grade elevations, slopes and tolerances.

2.02 LAYOUT OF THE WORK

A. Contractor shall employ a State of California licensed surveyor to lay out the entire Work, set grades, lines, levels, control points, vertical and horizontal control, elevations, grids and positions. Before the commencement of Work, surveyor shall, in conjunction with OWNER and CMR provided engineering survey of the Project site, locate all reference points and benchmarks, then lay out all lines, elevations, and measurements for the entire Work including but not limited to, buildings, grading, paving and utilities.

B. All work under this contract shall be built in accordance with the lines and grades shown on the plans. Field survey for establishing these, and for the control of construction, shall be the responsibility of the Contractor. All such survey work including construction staking shall be done under the supervision of a California Licensed Land Surveyor or authorized Civil Engineer. Staking shall be done on all items ordinarily requiring grade and alignment, at intervals normally accepted by the agencies and trade involved.

C. The Contractor shall be responsible for any errors in the finished work, and shall notify the Engineer, in writing, within 24 hours, of any discrepancies, or design errors during the construction staking.

D. Contractor shall immediately remediate any areas found not to meet specification requirements.

2.03 PERMANENT SURVEY MARKERS

A. Prior to the start of construction, the Contractor's licensed Land Surveyor or qualified Civil Engineer shall, in conformance with Section 8771 of the California State Business and Professions Code, locate all monuments (both of record and not of record), bench marks, and centerline ties within the construction zone, i.e., within one hundred feet of the construction activity. Additional ties to monuments shall be set when ties are missing (min. 4 ties per monument). The Contractor's Surveyor or qualified Civil Engineer shall prepare and submit for review to the City Engineer separate tie sheets and Corner Record sheets (monuments not of record shall have only tie sheets prepared). Corner Records shall conform to the County Engineers' Association of California's "Guide to the Preparation of Records of Survey and Corner Records" document as provided by the County Surveyor's Office. Upon review by the

City Engineer, the Land Surveyor shall file the Corner Records with the County Surveyor's Office. Certified Corner Records shall be filed with the City Engineer of the City that the work is being completed in.

B. After construction and prior to final acceptance by the Owner of the construction project, the Contractor's land surveyor or qualified Civil Engineer shall re-survey all field monuments and centerline ties within the construction zone, prepare tie sheets and Corner Record sheets as indicated above, and file them with the City Engineer for review. After review by the City Engineer, the Land Surveyor shall file the Corner Records with the County Land Surveyors Office, and file certified copies of the Corner Records with the City Engineer.

C. All survey monuments removed or altered as a result of construction shall be reset, Corner Records filed with the County Surveyor's Office, and approved final Corner Records filed with the City Engineer. Centerline ties removed as a result of construction shall be reset and tie sheets filed with the City Engineer.

D. The Land Surveyor shall provide a letter of certification for all monuments having four or more existing ties which are within 0.02 ft plus or minus of the original City tie sheet records. When several monuments and ties appear on one tie sheet and one of the ties has changed the Land Surveyor shall re-measure all of the ties and re-file a new tie sheet with the City as required herein.

E. County permanent and temporary bench marks within the construction zone shall be located by the surveyor, and the Contractor's Land Surveyor shall send a written notification of impending construction to the County of Orange Surveyor's Office two weeks prior to construction.

2.04 SURVEY REQUIREMENTS

A. Establish a minimum of two permanent horizontal and vertical control points on the Project site, remote from the building area, referenced to data established by the survey control points.

B. Indicate the reference points on the project record drawings with the basis of elevation being the established benchmarks

C. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.

D. Establish lines, grades, locations and dimensions by instrumentation. From time to time, verify the layout of all Work by the same methods.

E. Provide grade stakes and elevations to construct over excavation and re- compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.

F. Calculate and layout proposed finished elevations and intermediate control as required to provide smooth transitions between the spot elevations indicated in the Contract Documents.

G. Provide stakes and elevations for grading, fill, and topsoil placement.

H. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or AC surfaces at key locations such as BC’s, EC's, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.

I. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.
   1. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.
   2. Submit a certification, signed by the surveyor, confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured

elevations on the completed sub-grade, recorded to the nearest 0.01’. Building pad tolerance will be +-0.10'.

2.05 ESTABLISHMENT OF GRADES IN HARDSCAPE AREAS

A. All work shall conform to the lines, elevations, and grades shown on the Grading Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

B. Areas having drainage gradients of 2 percent or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.

C. Protect and maintain stakes in place until their removal is approved by the Owner. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.

2.06 STORM DRAIN & SANITARY SEWER PIPE INSTALLATION

A. All storm drain pipelines, sanitary sewer pipelines, trench drains, catch basins, cleanouts and drain inlets shall be staked by a licensed surveyor if slope of grade is less than 2% and a complete set of cut sheets shall be supplied to the inspector. All construction staking shall be installed and verified for grade and alignment prior to the start of construction.

2.07 RECORD DRAWINGS

A. Upon Substantial Completion, CONTRACTOR shall obtain and pay for reproducible transparencies of the as built survey drawings. Deliver to ARCHITECT, final "record" drawings of the original drawings and completed within specified tolerances.

B. Record drawings shall indicate locations by coordinate of all utilities onsite with top of pipe elevations at major grade and alignment changes, rim grate or top-of- curb and flow line elevations of all drainage structures and manholes

C. Completed record drawing transparencies shall be signed and certified as correct and within specified tolerances by the licensed surveyor.

D. Attention is called to other sections of the Contract Documents requiring verification or measurements of installed Work by survey. Surveyor shall perform and certify all such surveys or verification are completed in accordance with the Contract Documents.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Provisions of the General and Supplementary Conditions and Division One apply to this section.

B. Section Includes: Furnishing all labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, and required for completion of the Contract, as applicable. Includes items such as the following:
   1. Protecting existing work to remain.
   2. Cleaning soiled materials that are to remain.
   3. Disconnecting and capping utilities.
   4. Removing debris and equipment.
   5. Removal of items indicated on Drawings.
   6. Salvageable items to be retained by the Owner as indicated on the Drawings and during the pre-construction job walk.

C. Related Sections:
   1. Section 31 22 00: Grading

1.02 QUALITY ASSURANCE

A. Comply with the following:
   1. Applicable codes, ordinances, regulations of local, municipal, state and federal authorities having jurisdiction.
   2. Obtain necessary permits and notices, post where required.
   3. Comply with safety requirements of the local fire department.
   4. Comply with ANSI A10.6.

B. Notify affected utility companies before starting Work and comply with their requirements.

C. Carefully perform demolition work, by skilled workers experienced in building demolition procedures, using appropriate tools and equipment. Perform work, at all times, under the direct supervision of a supervisor approved by the Owner Inspector.

D. Coordinate demolition with other trades to ensure correct sequence, limits, and methods of proposed demolition. Schedule work to create least possible inconvenience to the public and to facility operations.

E. Pre-Demolition: Conduct conference at Project site 7 days prior to scheduled installation.
   1. Conference agenda shall include review and discussion of requirements of authorities having jurisdiction, instructions and requirements of serving utilities, sequencing and interface considerations and Project conditions.
   2. Conference shall be attended by supervisory and quality control personnel of Contractor and all subcontractors performing this and directly related work. Submit minutes of meeting to Design Builder’s Representative for Project record purposes.

1.03 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to location as directed by Owner's Representative.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Owner's Representative, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their

original locations.

E. Replace: Remove and legally dispose of existing item(s) indicated and install new like item(s) that conform to project specifications.

1.04 OWNERSHIP OF MATERIALS

A. Ownership of Materials: Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.05 PROJECT CONDITIONS

A. Drawings may not indicate in detail all demolition work to be carried out. Carefully examine existing conditions to determine full extent of demolition required. All utilities, whether shown on the drawings or not, to be capped at the property line U.N.O.

B. Repair damage due to demolition activities to existing improvements to remain at no additional cost to the Owner. Repair or replace as directed by the Owner Inspector.

C. Take measures to avoid excessive damage from inadequate or improper means and methods, or improper shoring, bracing or support. Repair or replace any resulting damage at no additional cost to the owner as directed by the Owner Inspector.

D. If conditions are encountered that vary from those indicated, notify the Owner Inspector for instructions prior to proceeding. Owner assumes no responsibility for actual condition of structures to be demolished.

E. Inform Owner immediately upon discovery of asbestos products, radioactive materials, toxic wastes or other hazardous materials. Do not remove hazardous materials without Owner authorization.

F. Adjacent roadways/passageways:
   1. Maintain fire department access through all phases of the project.
   2. Obstruction of streets, walks or other adjacent facilities will not be allowed.

1.06 DIG ALERT NOTIFICATION

A. Before any excavation in or near the public right-of-way, the Contractor must contact the Underground Service Alert of Southern California (Dig Alert) at 811 for information on buried utilities and pipelines.

B. Delineation of the proposed excavation site is mandatory. Mark the area to be excavated with water soluble or chalk based white paint on paved surfaces or with other suitable markings such as flags or stakes on unpaved areas.

C. Call at least Two (2) full working days prior to digging.

D. If the members (utility companies) have facilities within the work area, they will mark them prior to the start of your excavation and if not, they will let you know there is no conflict. A different color is used for each utility type (electricity is marked in red, gas in yellow, water in blue, sewer in green, telephone and cable TV in orange).

E. The Law requires you to hand expose to the point of no conflict 24" (inches) on either side of the underground facility, so you know its exact location before using power equipment.

F. If caught digging without a Dig Alert ticket you can be fined as much as $50,000 per California government code 4216.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Satisfactory Soil Materials: Soils approved by the testing geotechnical engineer and free of rock or gravel larger than 8 inches in any dimension, debris, waste, vegetation and other deleterious matter and as approved by the Geotechnical Engineer. Rocks or hard lumps larger then approximately 8 inches in diameter should be broken into smaller pieces or should be removed from the site. It is anticipated that most of the on-site soils may be reusable as engineered fill after any vegetation, construction debris, oversized material and deleterious

material is removed from the site.

B. Backfill & Native Fill Materials: The on-site soils may be reused as compacted engineered fill provided they comply to the requirements of “Satisfactory Soil Materials”, as described above.

C. Borrow / Imported Fill Material: Soil excavated from site or imported conforming to requirements for fill material.
   1. Materials for the fill shall be free from vegetable matter and other deleterious substances, shall not contain rocks or lumps of a greater dimension than is recommended by the geotechnical consultant, and shall be approved by the geotechnical consultant.
   2. Imported materials should have a Plasticity Index (PI) not less than 5 nor greater than 15, as determined by ASTM D 4318; an expansion index not exceeding 21, as determined by ASTM D 4829; and a particle size not exceeding 4 inches as determined by ASTM D 422.

D. Engineered Fill: Satisfactory Soil Materials / Borrow Fill Material, as described above, placed in lifts no greater than 8 inches thick (loose measurements) and each lift moisture conditioned. Clayey soil should be moisture conditioned to at least 2 percent over optimum moisture content. Fill with no significant clay content should be moisture conditioned to within 2 percent of the optimum moisture content. All engineered fill should be densified to a minimum relative compaction of 90 percent per ASTM D 1557.

E. Backfill Material for Trenches:
   1. The on-site soils may be used for backfilling utility trenches from one foot above the top of pipe to the surface, provided the material is free of organic matter and deleterious substances. Any soft and/or loose materials or fill encountered at pipe invert should be removed and replaced with properly compacted fill or adequate bedding material. Also, rocks larger than 8 inches and boulders should not be used as backfill.

2.02 HANDLING OF MATERIALS

A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the Owner’s Authorized Representative. Items shall be cleaned, packaged and labeled for storage.

B. Items scheduled for reuse shall be stored on site and protected from damage, soiling and theft.

PART 3 EXECUTION

3.01 GENERAL

A. Protection:
   1. Do not begin demolition until safety partitions, barricades, warning signs and other forms of protection are installed.
   2. Provide safeguards, including warning signs, lights and barricades, for protection of occupants and the general public during demolition.
   3. Provide and maintain fire extinguishers. Comply with requirements of governing authorities.
   4. Maintain existing utilities which are to remain in service and protect from damage during operations.

B. Safety: If at any time safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the Owner Inspector. Do not resume demolition until directed by the Owner Inspector.

C. Noise and Dust Abatement: Exercise all reasonable and necessary means to abate dust, dirt rising and undue noise. Perform necessary sprinkling and wetting of construction site to allay dust as required by applicable codes and ordinances

D. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations. Do not create hazardous or objectionable conditions, such as flooding and pollution, when using water.

E. Water for Dust Control: Contractor shall obtain and pay for all water required for his dust control operations. This may include, but is not limited to, payment of deposits to utility for construction meter, and payment of all monthly service and water charges. Construction meter shall be in place throughout construction period unless alternative arrangements are made with the Water Department to provide construction water for all purposes. Contractor shall be aware

of water moratoriums and restrictions, and shall immediately advise Owner of effects on construction schedules.

F. A 6 foot high, chain link fence and gates, shall be erected prior to any demolition operations at the construction limits perimeter. Coordinate the exact location with Owner.

G. Debris Removal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

H. Progress Cleaning: Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

I. Where performing contracted scope of work requires coring of existing concrete, brick masonry, or CMU structures (including Walls, Floors, and Sitework), contractor shall obtain and document means of verifying existence and location of embedded steel reinforcing materials within said concrete, brick and CMU assemblies. Contractor shall locate reinforcement by means of non-invasive technology such as X-ray photography for the purposes of protecting said reinforcement in place and shall not damage any reinforcement materials (rebar, etc.) unless specifically detailed as such and approved by the authority having jurisidiction.

J. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

K. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

L. Contractor shall provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

M. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.

N. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

O. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials if exposed, repaired surfaces shall match existing adjacent surface color finish and texture.
   1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

P. Disposal: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

3.02 PREPARATION

A. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as necessary.

B. Utilities:
   1. The Drawings do not purport to show all below-grade conditions and objects on the site. Contractor shall perform field investigations as necessary to establish location of underground utility services and other features affecting earthwork.
   2. Mark location of underground utilities on asphalt pavement with paint
   3. Disconnect and cap utility services; comply with requirement of governing authorities.
   4. Contractor shall arrange and notify utility company in advance of date and time when service needs to be disconnected.
   5. Do not commence demolition operations until associated disconnections have been completed.

6. Should utilities and other below-grade conditions be encountered which adversely affect the Work, discontinue affected Work and notify Owner's Representative and Architect and request direction. Unforeseen conditions will be resolved in accordance with provisions of the General Conditions of the Contract.
7. Should a utility line or structure be damaged, immediately notify the responsible utility company or agency and notify Owner's Representative and Architect.
    a. Repair or replace all damaged utility lines and structures as directed by the responsible utility company or agency.
    b. Repair or replacement of damaged utility lines and structures whole location or existence has been made known to the Contractor shall be at no change in the Contract Time and Contract Price.

C. Structures to be demolished shall be inspected for hazardous materials. Such materials shall be removed and disposed of before general demolition begins.

D. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner's Representative and Authority Having Jurisdiction (AHJ). Provide temporary services during interruptions to existing utilities, as acceptable to Owner's Representative and to Authority Having Jurisdiction (AHJ).

3.03 EXPLOSIVES

A. Explosives: Use of explosives will not be permitted.

3.04 DEMOLITION

A. Demolition, General:
1. With certain exceptions, the Contractor shall raze, remove and dispose of all buildings and foundations, structures, paving, fences and other obstructions that lie wholly or partially within the construction limits identified on Drawings. The exceptions are utility-owned equipment and any other items the Owner/Documents may direct the Contractor to leave intact or re-use onsite. Cease demolition immediately if adjacent structures appear to be in danger.
2. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
3. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner's Representative and Authority Having Jurisdiction (AHJ). Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
4. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
    a. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
    b. Protect existing site improvements, appurtenances, and landscaping to remain.
    c. Completely remove below-grade construction, including foundation walls and footings.
5. Filling Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition of buildings and pavements with soil materials according to requirements specified in Section 31 22 00- Grading.
6. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.
7. Unless otherwise indicated on the plans, remove all demolished material from the site and dispose of at approved disposal sites. Comply with all requirements for recycling of demolished material as called for in Division 1 of this Specification. The contractor shall obtain necessary permits for the transportation of material from the site.

3.05 CLEANING

A. Clean existing materials to remain, using appropriate tools and materials.

B. Protect adjacent materials and equipment during cleaning operations.

3.06 RESTORATION

A. Restoration of Site Finishes:
   1. Concrete paving: Where it is necessary to excavate a trench across make a cut in concrete paved areas, cut concrete cutting saw, full depth of paving.
   2. Bituminous paving: Where it is necessary to excavate a trench across make a cut in bituminous paved areas, either first score paving with a concrete cutting saw, in neat straight lines, prior to removing paving or make straight cuts with pneumatic spade.
   3. Restoration of paving: Restore all paved areas to their original condition using material of like type and quality as the removed paving. Paving in public ways shall conform to applicable requirements of authorities having jurisdiction. Repaired surfaces shall match existing adjacent paving except minimum depth shall be 3-1/2 inches where existing paving is less than 3-1/2 inches.
   4. Restoration of landscape planting: Restore soil and plant materials to match original condition, including additional topsoil, topsoil grading and preparation, new plant materials and plant maintenance during establishment period.

3.07 MAINTENANCE

A. Install and maintain all erosion control devices, including sandbag and gravel bag dikes, silt fences, de-silting basins, inlet barricades, vehicle wash traps, and other features called for in the Storm Water Pollution Prevention Plan and Temporary Erosion Control Plans.

3.08 CLEAN-UP/DISPOSAL

A. Coordinate building access with the Owner Inspector. Review and schedule waste storage and removal, include truck access to site.

B. Debris shall be dampened by fog water spray prior to transporting by truck.

C. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.

D. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where scheduled. Continuously clean-up and remove items as demolition work progresses. Do not allow waste and debris to accumulate in building or on site.

END OF SECTION

SECTION 03 05 16
UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet vapor barrier under concrete slabs on grade.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.03 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 01 33 00 Submittal Proceedures

B. Product Data: Submit manufacturers' data on manufactured products.

C. Test Data: Submit report of tests showing compliance with specified requirements.

D. Samples: Submit samples of underslab vapor barrier to be used.

E. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
   2. Complying with ASTM E1745 Class A.
   3. Thickness: 15 mils.
   4. Basis of Design:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.
      b. Substitutions: See Section 01 63 00 - Product Substitution Proceedures.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches.

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 03 47 13 - Tilt-Up Concrete: Formwork for Tilt-Up Panels

D. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Measurement and payment of forming work will be by the unit price method.

C. Formwork (Vertical Structures): Measure by the square foot. Includes form materials, placement, placing accessories, stripping.

D. Formwork (Horizontal Structures): Measure by the square foot. Includes form materials, placement, placing accessories, stripping.

1.04 REFERENCE STANDARDS

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Concrete Construction 2020.

C. ACI 318 - Building Code Requirements for Structural Concrete 2019 (Reapproved 2022).

D. ACI 347R - Guide to Formwork for Concrete 2014 (Reapproved 2021).

E. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices 2019, with Errata (2021).

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

I. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019, with Editorial Revision (2023).

J. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2022.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

L. PS 1 - Structural Plywood 2019.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on void form materials and installation requirements.

C. Designer's Qualification Statement.

D. Design Data: As required by authorities having jurisdiction.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State in which the Project is located.

B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of beams, joists, columns, and walls.

D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

E. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

B. Softwood Plywood: PS 1, C Grade, Group 2.

C. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.

D. Plywood: Douglas Fir species; solid one side grade; sound undamaged sheets with clean, true edges.

E. Lumber: Douglas Fir species; Appropriate for intended use grade; with grade stamp clearly visible.

2.03 FORMWORK ACCESSORIES

A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
   1. Products:
      a. Nox-Crete Inc; BIO-NOX: www.nox-crete.com/#sle.
      b. SpecChem, LLC; Bio Strip WB (water-based): www.specchemllc.com/#sle.
      c. W. R. Meadows, Inc; Duogard II (water-based): www.wrmeadows.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
   1. Products:
      a. BoMetals, Inc: www.bometals.com.
      b. Or Approved Equal.

C. Filler Strips for Chamfered Corners: Rigid plastic type; 3/4" by 3/4"; maximum possible lengths; Nox-Crete Inc; Clean Line Reveal: www.nox-crete.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.
   1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

C. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 03 47 13 - Tilt-up Concrete: Reinforcement for panels.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding connection to concrete reinforcement.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Concrete Construction 2020.

B. ACI 318 - Building Code Requirements for Structural Concrete 2019 (Reapproved 2022).

C. ACI SP-66 - ACI Detailing Manual 2004.

D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement 2019.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2019.

G. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement 2019, with Editorial Revision.

H. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2022a.

I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2019.

J. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2022.

K. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement 2019, with Editorial Revision (2020).

L. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement 2016.

M. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2022.

N. ASTM A1094/A1094M - Standard Specification for Continuous Hot-Dip Galvanized Steel Bars for Concrete Reinforcement 2020.

O. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2021.

P. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars 2018, with Amendment (2020).

Q. CRSI (DA4) - Manual of Standard Practice 2018, with Errata (2019).

R. CRSI (P1) - Placing Reinforcing Bars, 10th Edition 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
   1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.
   1. Maintain one copy of each document on project site.

B. Provide Architect with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Plain billet-steel bars.
   2. Unfinished.
   3. Galvanized in accordance with ASTM A767/A767M, Class I.
   4. Continuously galvanized in accordance with ASTM A1094/A1094M.
   5. Epoxy coated in accordance with ASTM A775/A775M.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
   1. Unfinished.
   2. Galvanized in accordance with ASTM A767/A767M, Class I.
   3. Continuously galvanized in accordance with ASTM A1094/A1094M.
   4. Epoxy coated in accordance with ASTM A775/A775M.

C. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.
   1. Galvanized in accordance with ASTM A767/A767M, Class I.
   2. Continuously galvanized in accordance with ASTM A1094/A1094M.
   3. Epoxy coated in accordance with ASTM A775/A775M.

D. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: 4 x 8-W6 x W10.

E. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.
   1. Products:
      a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Taper Tie Hole Plug: Mechanical device for plugging tie holes; anchors optional flush or recessed grout.
1. Products:
a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.
1. Products:
a. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

C. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
1. Galvanized Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with CRSI (DA4).

D. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

E. Locate reinforcing splices not indicated on drawings at point of minimum stress.
1. Review locations of splices with Architect.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as per structural drawings.

E. Comply with applicable code for concrete cover over reinforcement.

F. Bond and ground all reinforcement to requirements of Section 26 05 26.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency will inspect installed reinforcement for conformance to contract documents before concrete placement.

3.03 SCHEDULES

A. Reinforcement For Superstructure Framing Members: Deformed bars, unfinished.

B. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and welded wire reinforcement, galvanized finish.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.02 RELATED SECTIONS:

A. Section 03 05 16 - Underslab Vapor Barrier

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture, by a recognized, approved testing laboratory.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specifications for Structural Concrete"
   2. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials"
   3. ACI 318 - 14, "Building Code Requirements for Structural Concrete"

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 or ASTM A 706 where welded rebar occurs, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as- drawn steel wire into flat sheets.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type V, gray

B. Normal-Weight Aggregates: ASTM C 33, graded.
   1. Maximum Coarse-Aggregate Size: 1 inch
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.04 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.05 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2.06 VAPOR BARRIERS

A. Sheet Vapor Barrier: As required by Section 03 05 16 - Underslab Vapor Barrier.

2.07 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
   1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
   1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.08 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.09 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and ACI 318, Ch. 5. Submit to Architect/Engineers & Special Inspector for review of general conformance.

B. Cementitious Materials: Fly ash requirements with CBC 1903A.5. Fly ash or other pozzolan can be used as a partial substitue for ASTM C 150 portland cement as follows:
   1. Fly ash or other pozzolan shall fconform to ASTM C 618 for Class N or Class F materials (Class C is not permitted)
   2. No more than 15 percent by weight of fly ash or other pozzolans shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per ACI 318-14 Section 26.4.1.1. See 2016 CBC section 1904A for durabiility requirements.

3. No more than 15 percent by weight of ground-granulated blast-furnace slag conforming to ASTM C 989 shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per ACI 318-14 Section 26.4.1.1. See 2016 CBC section 1904A for durability requirements.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,500 pounds per square inch.
2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
5. Cement Content: Minimum 5 sacks per cubic yard.
   a. Minimum 5 sacks per cubic yard.
   b. Maximum 7 sacks per cubic yard.
6. Water-Cement Ratio: Maximum 45 percent by weight.
7. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
8. Maximum Slump: See structural plans.
9. Maximum Aggregate Size: 1 inch.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
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.

PART 3 EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer where indicated at exterior corners and edges of permanently exposed concrete.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 VAPOR BARRIERS

A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E 1643 and manufacturer's written instructions.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect. Architect to review if submittal and review by AOR is required.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 305R.

3.07 FINISHING FORMED SURFACES

A. Rough-Formed Finish at surfaces not exposed to view: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Smooth-Formed Finish at surfaces exposed to view: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete:
   1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces 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.

3.08 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Float Finish: Apply to surfaces indicated to receive trowel finish and are to be covered with fluid-applied or sheet waterproofing.

C. Trowel Finish Slab on Grade: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Trowel Finish: Apply to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

D. Trowel and Fine-Broom Finish Flatwork: Apply a first trowel finish to surfaces, while concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete steps, ramps, and elsewhere as indicated.

F. Sand Blast Finish: Light and medium where indicated.

3.09 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed 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, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during 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 subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

SECTION 03 35 00
CONCRETE SEALER

PART 1 GENERAL

1.01 SUMMARY

A. Product used to densify, seal and dust-proof horizontal interior/exterior concrete surfaces.

1.02 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place concrete

1.03 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Submit manufacturer's data sheets and safety data sheets (SDS) on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Samples: Submit samples of specified traffic deck system. Samples shall be construed as examples of finished color and texture of the system only.
   5. Warranty: Submit copy of manufacturer’s standard warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Applicator Qualifications: Minimum 2 year experience installing similar products.

C. Field Sample:
   1. Install a sizeable field sample at the discretion of the Engineer of Record.
   2. Apply material in accordance with manufacturer’s written application instructions.
   3. Field sample will be standard for judging color and texture on remainder of project.
   4. Maintain field sample during construction for workmanship comparison.
   5. Do not alter, move, or destroy field sample until work is completed and approved by owner’s representative.

D. Requirement of Regulatory Agencies: comply with applicable codes, regulations, ordinances and laws regarding use and application of coating systems.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver: Materials shall be delivered in original sealed containers, clearly marked with supplier’s name, brand name, type of material and legible lot number.

B. Storage and Handling: Recommended material storage temperature is 75°F (23°C). Handle products to prevent damage to container. All materials shall be stored in compliance with fire and safety requirements. Do not store at high temperatures or in direct sunlight.

1.06 PROJECT CONDITIONS

A. Prior to starting work, read and follow the Safety Data Sheet (SDS) and container labels for detailed health and safety information.

B. Do not proceed with application of material when surface temperature is less than 40°F, if precipitation is imminent, or when a damp, unclean or frosty surface. Ambient temperature should be a minimum 40°F and rising, and more than 5° above dew point. Special precautions are to be taken when ambient and/or surface temperature are approaching, at, or above 100°F and it may be necessary to limit material application to evening hours for exterior exposed decks.

C. Coordinate waterproofing work with other trades. Applicator shall have sole right of access to the specified area for the time needed to complete the application and allow the vehicular traffic coatings to cure adequately.

D. Protect plants, vegetation or other surfaces not to be coated against damage or soiling.

E. Keep products away from spark or flame. Do not allow the use of a spark producing equipment during application and until all vapors have dissipated. Post "No Smoking" signs.

F. Maintain work area in a neat and orderly condition, removing empty containers, rags and rubbish daily from the site.

1.07 WARRANTY

A. Provide manufacturer's standard warranty for institutional projects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bases of Design Manufacturer: MAPEI Americas, 1144 E. Newport Center Dr., Deerfield Beach, FL 33442, Tel. 888-365-0614, Email: mpineda@mapei.com

B. Requests for substitutions will be considered in accordance with 01 63 00 - Product Substitution Procedures.

2.02 MATERIALS

A. Concrete Densifier and Sealer
   1. MAPECRETE HARD LI

2.03 MATERIAL PERFORMANCE CRITERIA

A. Product Characteristics:
   1. Water-based, VOC-free, lithium-silicate solution
   2. Solids content: 16%
   3. Consistency: Clear, thin liquid
   4. VOC’s (Rule of California’s SCAQMD): 0 g per L
   5. pH: 12.3

PART 3 EXECUTION

3.01 EXAMINATION

A. New, cured of at least 7 days old and existing concrete surfaces.

3.02 PREPARATION

A. For new concrete:
   1. After final troweling, moisture-cure or sheet-membrane-cure in accordance with ASTM C171, or use a clear, non-residual curing compound in accordance with ASTM C309. Cure for 7 days or longer for best results.
   2. Concrete surface must be free of loose particles, efflorescence, paints, tars, grease, asphaltic materials, bond breakers, curing compounds, wax and any other contaminants before application.
   3. Allow the concrete to air-dry at least 24 hours after cleaning.

3.03 MIXING

A. Comply with manufacturer’s instructions for mixing procedures.

3.04 APPLICATION

A. Additional coats may be applied if the concrete surface is very absorptive.

B. Remove all excess material. Do not allow excess to dry on the surface.

C. Any areas showing patches of white on the floor should be immediately flooded with hot water and scrubbed.

END OF SECTION

SECTION 03 35 11
POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDE

A. Surface sealers and hardeners and polishing of concrete floors and slabs.

1.02 REFERENCE STANDARDS

A. ASTM D2370 - Standard Test Method for Tensile Properties of Organic Coatings; 1998 (Reapproved 2010).

1.03 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.04 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Applicators shall be factory trained and certified.
   2. Applicators shall have experience with installation of the size and type of this project.

B. Manufacturer’s Certification: Provide letter of certification from the concrete finish manufacturer stating that the installer was factory train and is certified to install the products per the procedures and installation requirements of the work in this section.

C. MOCK-UP
   1. Apply mock-up to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
   2. Mock-Up Size: 10 feet square.
   3. Locate where directed.
   4. Mock-up may remain as part of the work.

D. Protection:
   1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
      a. The slab must be protected at all times.
   2. Application shall take place 10 days prior to installation of equipment and substantial completion, thus providing an uninhibited concrete floor for application.
   3. Close floor area to traffic during application, and after application for the time period recommended in writing by the manufacturer.

E. Pre-Installation Conference: Conduct conference at project site.
   1. Agenda:
      a. Examine substrate, with installer and manufacturer's representative, for conditions affecting performance of finish.
      b. Review manufacturer's installation requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

B. Maintain record of number of container used.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ADVANCED FLOOR PRODUCTS, INC.
   1. Retro-plate 99 Concrete Polish System, Bases of Design

B. L&M Construction Chemicals
   1. Equal Product to Bases of Design

C. Scofield
   1. Equal Product to Bases of Design

2.02 MATERIALS

A. Hardening/Sealing Agent
   1. Performance Criteria:
      a. Abrasion Resistance: ASTM C779 - Up to 400% increase in abrasion resistance.
      b. Impact Strength: ASTM C805 - Up to 21%increase inpact strength.
      c. Ultra Violet Light and Water Spray: - ASTM G23-81 - No adverse effect to ultra violet light and water spray.
      d. Reflectivity: Up to 30% increaser in reflectivity.
      e. Slip Resistence

B. Neutralizing Agent: Tri-sodium Phosphate.

C. Water: Potable.

D. Concrete Color Dyes - Solvent or Water Based:
   1. AmeriPolish Dye.
   2. Colors: As selected by Architect from manufacturer's full range of colors.

E. Heavy Duty Concrete Sealer:
   1. RetroGuard
   2. RetroPel

F. Concrete Joint Filling and Concrete Repair Material
   1. CreteFili Pro Series by ADVANCED FLOOR PRODUCTS.
      a. CreteFill Pro 65, 75, 85 appropriate joint filler.
      b. CreteFill Pro Crack Repair
      c. CreteFill Pro Spall Repair
   2. CreteFill Ro Series:
      a. Color: Match color of floor as approved by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surface is acceptable to receive the work of this section.

3.02 APPLICATION

A. Start any of the floor finish applications in the presence of the manufacturer's technical representative.

B. Floor Preparation:
   1. Floor to be prepared for the RetroPlate System with specified diamond grinding steps and methodology as specified by Advanced Flooring Products, beginning with grinding the floor surface to expose:
      a. Class B - Salt/Pepper Finish: To remove approximately 1/32 to 1/16 inch of concrete, exposing small aggregate.

C. RetroPlate 99, Densifier application:
   1. Apply RetroPlate 99 in accordance with manufacturer's application instructions.

D. Concrete Polishing Levels:
   1. Level 1 - Low gloss: Honed/matte finish, polished up to and including 400 grit resin diamonds, a gloss reading of 10-20.

E. Concrete Heavy Duty Sealer:
   1. Apply RetroGuard or RetroPel to polish concrete surface per manufacturer's application instructions.

F. Per CBC Section 11B-302.1, the finished polished concrete flooring shall be stable, firm, and slip resistant.

3.03 WORKMANSHIP AND CLEANING

A. Protect adjoining surfaces from operational splatter and damage.

B. Remove debris from jobsite: Dispose in accordance with local regulations.

3.04 PROTECTION

A. Protect finished work until fully cured in accordance with manufacturer's written recommendations.

END OF SECTION

SECTION 03 47 13
TILT-UP CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tilt-up, site cast concrete wall panels, integrally insulated, load bearing, erected from forms to final position.

B. Supports, devices, and attachments.

C. Grouting under panels.

D. Patching and completion.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 05 50 00 - Metal Fabrications

C. Section 09 91 13 - Exterior Painting

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Concrete Construction 2020.

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

C. ACI 305R - Guide to Hot Weather Concreting 2020.

D. ACI 306R - Guide to Cold Weather Concreting 2016.

E. ACI 318 - Building Code Requirements for Structural Concrete 2019 (Reapproved 2022).

F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

H. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.

J. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric) 2021a.

K. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2022a.

L. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2019.

M. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.

N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.

O. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.

P. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2020.

Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2019.

R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2020.

S. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions 2019.

T. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series 2017a.

U. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.

V. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.

W. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene not later than one week prior to commencing work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' current data on manufactured items used, including recommended methods of installation, relevant installation limitations, and safety precautions.

C. Compatibility Statement: Submit certification that all admixtures, bond breakers, curing compounds, and other accessory materials are compatible with one another and expressly intended for proposed use.

D. Shop Drawings: Indicate layout, tilt-up unit locations, configuration, unit identification marks, reinforcement, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent components.

E. Proposed Mix Design: Submit proposed mix design for each tilt-up unit type before starting work, complying with Section 01 40 00 - Quality Requirements.

F. Laboratory Reports: Submit certified laboratory test reports confirming physical characteristics of materials used in performance of the Work of this section.

G. Designer's Qualification Statement.

H. Panel Fabricator's Qualification Statement.

I. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

J. Sustainable Design Reporting: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete, mix design(s) used showing the quantity of Portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with ACI 318.

B. Maintain one copy of quality assurance standards on project site.

C. Designer Qualifications: Design units under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

D. Fabricator Qualifications: Company specializing in site-cast tilt-up concrete construction with minimum 5 years of documented experience.
   1. Membership: Member in good standing of the Tilt-Up Concrete Association.

E. Welding Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

1.07 MOCK-UP

A. Provide mock-up panel as quality control for architectural finishes and coordination of work with other sections.

1. Panel Size: Minimum 4 by 8 feet, using forming system and construction methods to be used on project.
2. Details: Incorporate typical edge, reveal, and corner conditions.
   a. Panel shall illustrate the double vertical with horizontal reveal pattern as detailed.
3. Finishes: Demonstrate full range of color and finished surface to be expected in completed panels.
4. Architectural Liners: Incorporate vertical and horizontal liner joints in mock-up.
5. Construction Joints: Cast mock-up over slab joint or column joint if actual panels will be affected by such condition.
6. Illustrate the method for termination or infill of the reveals behind roofing and roof flashing.

B. Locate where directed and maintain approved mock-up for comparison to finished work.

C. Mock-up may not remain as part of the Work.
   1. Dispose of mock-up when directed by [CHOICE TEXT].

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handling Tilt-up Units: Lift units to position, consistent with their shape and design. Lift and support only from support points.

B. Blocking and Lateral Support During Erection: Use materials that are clean and non-staining. Provide temporary lateral support to prevent bowing, warping, or cracking.

C. Protect units from staining, chipping, or spalling.

1.09 FIELD CONDITIONS

A. Adverse Weather: Do not construct formwork, place reinforcing steel or concrete, or erect panels during adverse weather unless measures acceptable to Architect are taken to prevent damage.

B. Cold Weather: Comply with provisions of ACI 306R for freezing or near-freezing conditions.
   1. Provide adequate equipment for heating and protecting concrete materials.
   2. Do not use concrete materials, reinforcing steel, forms, fillers, ground surface, or other materials that are frozen, frost-covered or that contain ice.
   3. If shelters are used, do not use fuel that will weaken concrete surfaces.

C. Hot Weather: Comply with provisions of ACI 305R for high temperature conditions.
   1. During periods of dry winds, low humidity, and other conditions that cause rapid drying, protect fresh concrete with an evaporation retardant or fine fog spray of water applied immediately after screeding and bull floating.
   2. Maintain protection until final finishing and curing compounds are applied.

PART 2 PRODUCTS

2.01 TILT-UP PANEL UNITS

A. Tilt-Up Panel Units:
   1. Concrete: Minimum 4,500 psi, 28 day strength, air entrained to 5 to 7 percent; comply with ACI 301.
   2. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
   3. Calculate structural properties of units in accordance with ACI 318.
   4. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with strength and appearance requirements.
   5. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   6. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.
   7. Provide lifting hardware and lifting system appropriate to panel size and configuration.

2.02 PANEL MATERIALS

A. Forms: Design to withstand stresses resulting from concrete casting process and to maintain panels within 1/4 inch deflection limit; construct from steel or wood, rigidly braced, straight and with precise corners.
   1. Include blockouts as required to provide openings detailed on drawings, designed to limit deflection during pouring to maximum of 1/8 inch.
   2. Provide smooth and clean forming surfaces prior to concrete placement.
   3. Panels may be stacked for ease of casting in forms as specified above.
      a. When panels are stack cast, maintain a continuous sound and smooth casting to match the finish of the original casting surface.
   4. For forms attachment to slab, use non-intrusive glues or adhesives in lieu of nails and bolts to eliminate penetrations and blemishes.
   5. Bondbreaker shall be compatible with curing compound or be completely removed according to the manufacturer's cleaning instructions prior to the installation of any subsequent finishes.

B. Concrete: Provide concrete materials in accordance with Section 03 30 00.

C. Reinforcing Steel: As specified in Section 03 20 00.

D. Form Bond Breaker: Non-staining, non-discoloring, leaves no residue; compatible with curing compound used on casting slab and with finishes to be applied to cast surfaces.
   1. Composition: Colorless, reactive, water-based or solvent-based compound.
   2. Do not use materials containing wax, silicone, or petroleum-based compounds.
   3. VOC Content: In compliance with applicable local, State, and federal regulations.
   4. Manufacturers:
      a. Nox-Crete Inc; SilcoSeal Classic: www.nox-crete.com/#sle.
      b. Nox-Crete Inc; SilcoSeal EX: www.nox-crete.com/#sle.
      c. Nox-Crete Inc; SilcoSeal LVOC: www.nox-crete.com/#sle.
      d. Nox-Crete Inc; SilcoSeal Select: www.nox-crete.com/#sle.
      e. SpecChem, LLC; Spec Tilt WB: www.specchemllc.com/#sle.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

E. Curing Compound: Liquid membrane-forming compound complying with ASTM C309, Type I and ID, Class B.
   1. Manufacturers:
      a. SpecChem, LLC; Spec Tilt WB: www.specchemllc.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Curing Covers: Reusable, impregnated fiber mat with a white or light colored backing, complying with ASTM C171 for reflectivity and moisture retention.

G. Non-Shrink Grout: ASTM C1107/C1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Height Change, Plastic State; when tested according to ASTM C827/C827M:
      a. Maximum: Plus 4 percent.
      b. Minimum: Plus 1 percent.
   2. Minimum Compressive Strength at 48 Hours: 2,400 psi.
   3. Minimum Compressive Strength at 28 Days: 10,000 psi.
   4. Manufacturers:
      a. SpecChem, LLC; SC Multi-Purpose Grout: www.specchemllc.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

H. Sacking Materials: Portland cement and water, mixed to a uniform creamy paste.

2.03 REVEAL AND ACCENT STRIPS

A. Bases of Design Manufacturer:
   1. Nox-Crete Inc; Clean Line Reveal: www.nox-crete.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Material: Non-staining, non-reactive, extruded high-density PVC.

C. Profiles:
   1. Reveal: CRL 1
   2. Chamfer: CRL 10

2.04 SUPPORT AND LIFTING DEVICES

A. Lifting Hardware, Connecting, and Support Devices: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
   1. For support of reinforcing steel, plastic-tipped steel or all plastic supports are also acceptable.

B. Miscellaneous Metal Items: Provide inserts, dowels, and other items to be cast into panels as specified in Section 05 50 00, galvanized after fabrication in accordance with ASTM A123/A123M.

C. All-Plastic Supports: Provide units of adequate strength, with surface contact of not more than 0.10 sq. inches per contact point, and colored to blend with concrete.

D. Bolts, Nuts, and Washers: ASTM A307 heavy hex bolts, Type A, hot-dip galvanized, with matching ASTM A563/A563M nuts and matching washers.

E. Bolts, Nuts, and Washers: ASTM F3125/F3125M heavy hex structural bolts, Type 1, with matching ASTM A563/A563M nuts, and washers as follows:
   1. Standard Washers: ASTM F436/F436M washers, in finish matching bolts.
   2. Compressible Direct Tension Indicators: ASTM F959/F959M, Type 325-1.

F. Primer: Zinc rich oil alkyd.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

B. Verify that casting slab is cured and ready for work of this section. Fill cracks, saw cuts, joints, or defects that would adversely affect appearance of tilt-up panels.

3.02 PREPARATION

A. Coordinate site cast tilt-up operations with work of other sections to expedite the Work and avoid omissions and delays.

B. Apply bondbreaker to casting slab in accordance with manufacturer's recommendations.

C. Provide for erection procedures and induced loads during erection, and provide for temporary bracing that will remain in place until roof diaphragm has been completely installed and connected.

3.03 FORMING PANELS

A. General: Maintain environmental records and quality control program during production of tilt-up units. Make records available upon request.

B. Lay out panels in manner that will minimize joints in panel faces. Coordinate installation of inserts and anchorages.

C. Maintain consistent quality during construction of forms.

D. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.

E. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items as indicated.

F. Place and embed flashing reglets in continuous lengths without gaps, and properly positioned. Refer to Section 07 62 00.

G. Locate hoisting devices to permit removal after erection.

H. Work concrete thoroughly around reinforcement, around embedded items, and into corners of the forms. Consolidate concrete in accordance with ACI recommendations.

I. Cold joints are not permitted in any individual panel.

3.04 PLACING AND CURING CONCRETE

A. Mix and deliver concrete in accordance with ASTM C94/C94M, Option A, and in compliance with recommendations of ACI 304R.

B. Protect freshly placed concrete from premature drying and excessively hot or cold temperatures.

C. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

D. Apply liquid membrane curing compound in accordance with manufacturer's recommendations.

E. Moist Curing:
   1. Cover panels completely with burlap strips immediately after finishing. Quickly and completely wet entire exposed surface.
   2. Cover panels with curing covers to prevent evaporation, and keep covered for seven days. Do not allow alternate wetting and drying.

F. Minor patching is acceptable, providing structural adequacy and appearance of units are not impaired.

3.05 FINISHING CONCRETE

A. Finish exposed surfaces of panels including both the front and back of the panels as well as any exposed edges. Visible surfaces of the panels, when in place shall be free from surface defects as defined below.

B. Grade A - Architectural Finish: Ground level to a height of 20 feet above ground level
   1. Panel surfaces must be free of voids, holes, pockets, and other surface deformations greater than 1/8 inch and must not telegraph imperfections from the casting surface, including floor joints.
   2. Cracks in excess of 1/32 inch width are not acceptable.
   3. Reveals may not deviate from their correct position by more than 1/8 inch in 10 feet.
   4. Repairs must not be apparent from a minimum distance of 10 feet.

C. Grade B - Standard Finish: For distance greater than 20 feet above ground level.
   1. Panel surfaces must be free of voids, holes, pockets, and other surface deformations greater than 1/4 inch.
   2. Curing cracks are acceptable, but structural cracks resulting from erection forces are not acceptable.
   3. Reveals may not deviate from their correct position by more than 1/4 inch in 10 feet.
   4. Repairs must not be apparent from a minimum distance of 25 feet.

D. Grade C - Utility Finish: for panels covered by furred gypsum board walls.
   1. Panel surfaces showing voids, holes, pockets, and other surface deformations are permissible, provided they do not affect the structural integrity of the panel and provided they do not exceed 1/2 inch in greatest dimension.
   2. Cracked surfaces are permissible, provided the cracks have not resulted from structural weakness or failure and provided they do not present the potential for failure of the finish over the life of the building.

E. Interior Exposed Finish: Trowelled.

F. Painting: Prepare surfaces to be painted as specified in Section 09 91 13.

3.06 SITE FABRICATION TOLERANCES

A. Unless otherwise approved by Architect, provide panels complying with casting tolerances as specified below.

B. Panel Height and Width:

1. Up to 20 feet: 1/4 inch maximum.
2. 20 to 30 feet: 3/8 inch maximum.
3. Each additional 10 ft increment: 1/8 inch maximum.
4. Maximum overall tolerance: 5/8 inch

C. Panel Thickness: 3/16 inch maximum average variation through any vertical or horizontal cross section.
   1. Minimum number of panel thickness measurements, when taken, shall be four (4) for each 5,000 sq.ft. or part thereof, or a minimum of three (3) measurements in any one panel less than 5,000 sq.ft.

D. Skew of Panel or Opening: Measured as difference in length of the two diagonals:
   1. Per 6 feet of diagonal dimension: 1/8 inch maximum.
   2. Maximum total difference: 1/2 inch.

E. Panel Openings:
   1. Size: 1/4 inch maximum.
   2. Location of Centerline: 1/4 inch maximum.

F. Location and Placement of Embedded Items:
   1. Inserts, Bolts, and Pipe Sleeves: 3/8 inch.
   2. Lifting and Bracing Inserts: As specified by manufacturer.
   3. Weld Plate Embedments: 1 inch for location; 1/4 inch for tipping and flushness.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will perform concrete mix testing.

B. Take minimum of 5 cylinders for each 150 cubic yds or fraction thereof, of each class of concrete, for each day concrete is cast, or not less than once for each 5000 sq ft of panel area. Field cure test speciments.
   1. Cylinders: Make and cure test cylinders in accordance with ASTM C31/C31M. Test two cylinders at 7 days and two at 28 days and hold last cylinder for 56 days if needed for low test results.

C. Take one slump tests for every 5 test cylinders in accordance with ASTM C143/C143M.

D. Take one air entrainment test cylinder for each set of exterior concrete test cylinders taken.

E. Submit copies of test reports within 24 hours of test, indicating location of panels for each set of test results.

3.08 DEFECTIVE CONCRETE

A. Defective Concrete: If test results indicate concrete does not comply with specified requirements, Contractor with the agreement of Architect must adjust mix to provide acceptable concrete on subsequent work. For concrete not meeting specified requirements, Owner may require core specimens to be taken and tested, at Contractor's expense. Concrete cores that test below specified requirements will be deemed to be defective.

B. Repair or replacement of defective concrete will be determined by the Architect and will be paid for by Contractor. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

C. Do not patch, fill, touch-up, repair, or replace damaged or defective concrete except upon express direction of Architect for each individual area.

3.09 ERECTION

A. Before beginning erection operations, verify that site conditions are appropriate for the work. Mark elements to comply with designations indicated on approved shop drawings.

B. Employ erection equipment that will prevent damage to existing construction, permanent floor slabs, and tilt-up panels. Protect panels to prevent staining, warping, or cracking.

C. Set panels in assigned positions. Erect members level and plumb within allowable tolerances. Grout space under panels for full bearing, or provide additional support until subsequent

grouting operations are completed.

D. Align and maintain uniform horizontal and vertical joints, as erection progresses.

E. When members require adjustment beyond design or tolerance criteria, discontinue affected work; advise Architect.

F. Fasten units in place with mechanical connections.

G. Weld units in place. Perform welding, including tack welds, in accordance with AWS D1.1/D1.1M.

H. Provide non-combustible shields during welding operations.

I. Touch-up field welds and scratched or damaged galvanized surfaces.

J. Brace panels not attached to building frame at time of erection, using a bracing system designed to resist wind and other applicable loads until all structural connections have been made. Provide minimum of two braces per panel and maintain connections daily.

K. Set units dry, without grout, attaining joint dimension with lead or plastic spacers. Grout pack base of unit.

L. Exposed Joint Dimension: 1/2 inch. Adjust units as required to bring joint dimensions within allowable tolerances.

M. Patch holes, cut-off anchors, surface defects, and damaged corners to match panel with epoxy/cement paste adhesive.

N. After panel erection, patch holes or other blemishes in casting slab that were caused by the panel casting or erection processes, using techniques acceptable to Architect.

3.10 ERECTION TOLERANCES

A. Unless otherwise approved by Architect, install site-cast tilt-up panels within erection tolerances as specified below.

B. Replace panels that cannot be installed within specified tolerances.

C. Joint Width Variation:
   1. Up to 20 feet tall panels: 1/4 inch maximum.
   2. Each additional 10 ft increment: 1/8 inch maximum.
   3. Do not increase or decrease joint width more than 50 percent from specified joint width in any case, as measured between panels at exterior face.

D. Joint Taper:
   1. Up to 20 feet tall panels: 1/4 inch maximum.
   2. Each additional 10 ft increment: 1/8 inch maximum.
   3. Maximum for entire length of panel: 3/8 inch width difference for non-parallel panel edges.

E. Panel Alignment:
   1. Horizontal and Vertical Joints: 1/4 inch maximum.
   2. Offset in Adjacent Exterior Panel Faces: 1/4 inch.

3.11 PROTECTION

A. Protect units from damage by subsequent construction activities.

END OF SECTION

SECTION 04 05 11
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry.

B. Section 08 11 13 - Hollow Metal Doors and Fames

1.03 REFERENCE STANDARDS

A. ASTM C5 - Standard Specification for Quicklime for Structural Purposes 2018.

B. ASTM C91/C91M - Standard Specification for Masonry Cement 2023.

C. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.

D. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.

E. ASTM C150/C150M - Standard Specification for Portland Cement 2022.

F. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019a, with Editorial Revision.

H. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar 2017.

I. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.

J. ASTM C476 - Standard Specification for Grout for Masonry 2023.

K. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry 2020.

L. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.

M. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry 2020.

N. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength 2022.

O. ASTM C1142 - Standard Specification for Extended Life Mortar for Unit Masonry 1995 (Reapproved 2013).

P. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms 2023.

Q. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry 2019a.

R. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry 2022.

S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2022, with Errata.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.

E. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
   1. Maintain one copy of each document on project site.

1.06 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 40 00 - Quality Requirements.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Mortar Mix Designs: ASTM C270, Property Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, Loadbearing Masonry: Type S
   3. Exterior Repointing Mortar: Type S with maximum 2 percent ammonium stearate or calcuim stearate per cement weight.
   4. Interior, Loadbearing Masonry: Type S.
   5. Interior, Non-loadbearing Masonry: Type S.

D. Grout Mix Designs:
   1. Bond Beams and Lintels: 2,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
   2. Engineered Masonry: 2,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
      a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
      b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.02 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type S.
   2. Color: Standard gray unless otherwise noted
   3. Water repellent mortar for use with water repellent masonry units.
   4. Manufacturers:
      a. Amerimix: AMX 400 series: www.amerimix.com
      b. Amerimix; AMX 410 series: www.amerimix.com
      c. Or Approved Equal.

B. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, hydrated lime, and graded sand; capable of producing Type O mortar in accordance with ASTM C270 with the addition of water only.
   1. Color: Standard gray unless otherwise noted
   2. Manufacturers:
      a. Amerimix; AMX 420: www.amerimix.com
      b. Or Approved Equal.

C. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
   1. Type: Fine.
   2. Manufacturers:
      a. Amerimix; AMX 600: www.amerimix.com
      b. Or Approved Equal.

D. Portland Cement: ASTM C150/C150M.
   1. Type: Type I - Normal; ASTM C150/C150M.
   2. Color: Standard gray unless otherwise noted

E. Hydrated Lime: ASTM C207, Type S.

F. Quicklime: ASTM C5, non-hydraulic type.

G. Mortar Aggregate: ASTM C144.

H. Grout Aggregate: ASTM C404.

I. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range.
   2. Manufacturers:
      a. Solomon Colors; Solomon Colors Concentrated A, H, and X Series: www.solomoncolors.com/#sle.
      b. Davis Colors: www.daviscolors.com/#sle.
      c. Lambert Corporation: www.lambertusa.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

J. Water: Clean and potable.

K. Bonding Agent: Latex type.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

E. Do not use anti-freeze compounds to lower the freezing point of mortar.

F. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.

B. Low-Lift Grouting:
   1. Limit height of pours to 48 inches inches.
   2. Limit height of masonry to 8 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

C. High-Lift Grouting:
   1. Conform to the requirements of DSA document IR 21-2.
   2. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
   3. Place grout for spanning elements in single, continuous pour.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 40 00 - Quality Requirements.

B. Test and evaluate mortar in accordance with ASTM C780 procedures.
   1. Test with same frequency as specified for masonry units.

C. Test and evaluate grout in accordance with ASTM C1019 procedures.
   1. Test with same frequency as specified for masonry units.

D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518/E518M; perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. Section includes concrete masonry units; reinforcement, anchorage, and accessories.

1.02 REFERENCES

A. American Concrete Institute:
   1. ACI 530 - Building Code Requirements for Masonry Structures.
   2. ACI 530.1 - Specifications for Masonry Structures.

B. ASTM International:
   1. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   4. ASTM A580/A580M - Standard S:,ecification for Stainless Steel Wire.
   5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   6. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   7. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
   8. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction.
   9. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
   10. ASTM C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

1.03 PERFORMANCE REQUIREMENTS

A. Concrete Masonry Compressive Strength (fm): 2000 psi typical; determined by strength method.

B. Concrete Masonry Units: 2000 psi minimum net area compressive strength.

1.04 SUBMITTALS

A. Shop Drawings: Indicate bars sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, accessories.

B. Product Data:

C. Submit data for masonry units and wall ties anchors and other accessories.

D. Samples: Submit four samples of units to illustrate color, texture and extremes of color range.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 SUSTAINABLE DESIGN SUBMITTALS

A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
   1. Materials Resources Certificates:
      a. Certify source and origin for [salvaged] [and] [reused] products.
      b. Certify recycled material content for recycled content products.
      c. Certify source for local and regional materials and distance from Project site.
      d. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.

B. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Salvaged products.
      b. Reused products.
      c. Products with recycled material content.
      d. Local and regional products.
      e. Certified wood products.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

B. Sustainable Design Requirements:
   1. Recycled Content Materials: Furnish materials with recycled content.
   2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site including
   3. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines including:

C. Perform Work in accordance with the State of California's Public Works standard.

D. Maintain one copy of each document on site.

1.07 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three years [documented] experience.

1.08 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this section.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

1.10 COORDINATION

A. Coordinate masonry work with installation of window and door anchors.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Hollow Load Bearing Concrete Masonry Units (CMU): ASTM C90; medium weight.

B. Concrete Masonry Unit Size and Shape: Nominal modular size of 8x8x16 inches and 12x8x16 inches.
   1. Size and Shape: Nominal modular size as indicated on the structural drawings. Furnish special units for 90 degree corners, bond beams, and lintels.
   2. Type: Precision
   3. Color: Match *ORCO* Black 100
   4. Weight: Medium

2.02 ACCESSORIES

A. Reinforcing Steel: ASTM 615/A615M36o ksi yield grade, deformed billet bars, uncoated finish

B. Weldable Reinforcing Steel: ASTM 706, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Anchor Rods: ASTM F1554: Grade 36; complete with washers and heavy hex nuts; sized for minimum 15 inch embedment.

D. Mortar and Grout: As specified in Section 04 05 03.

E. Galvanized Steel: ASTM A653/A653M, G90 finish, 24 gage core steel.

F. Coping Flashing: Stainless steel, soft temper; 0.015 inch thick, Copper, cold rolled; 16 oz/sq ft; smooth finish; formed with ribs 3 inches on center for integral mortar bond.

G. Preformed Control Joints:Neoprene material. Furnish with corner and tee accessories, cement fused joints.

H. Joint Filler: Closed cell polyethylene polyurethane oversized 50 percent to joint width; self expanding.

I. Building Paper: ASTM D226; Type I, No. 15 unperforated asphalt felt.

J. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

K. Weeps: Open head joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive work.

B. Verify items provided by other sections of work are properly sized and located.

C. Verify built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.03 INSTALLATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.

C. Coursing of Concrete Masonry Units:
   1. Bond: Typical CMU walls are constructed with running bonds. CMU walls constructed with stack bonds are specified in structural and architectural drawings.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Flush.

D. Placing and Bonding:
   1. Lay hollow masonry units with face shell bedding on head and bed joints.
   2. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
   3. Remove excess mortar as Work progresses.
   4. Interlock intersections and external corners.
   5. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
   6. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
   7. Cut mortar joints flush where bitumen dampproofing is applied.
   8. Isolate masonry from vertical structural framing members with movement joint [as indicated on Drawings].

E. Anchorage:
   1. Embed anchors embedded in concrete attached to structural steel members.

F. Lintels:
   1. Reinforce openings as indicated on Drawings.
   2. Do not splice reinforcing bars.
   3. Support and secure reinforcing bars from displacement.

4. Place and consolidate grout fill without displacing reinforcing.
5. Allow masonry lintels to attain specified strength before removing temporary supports.

G. Grouted Components:
1. Lap splices bar diameters required by code.
2. Support and secure reinforcing bars from displacement.
3. Place and consolidate grout fill without displacing reinforcing.

H. Reinforced Masonry:
1. Lay masonry units with cells vertically aligned and clear of mortar and unobstructed.
2. Place reinforcing, reinforcement bars, and grout as indicated on Drawings.
3. Support and secure reinforcement from displacement.
4. Place and consolidate grout fill without displacing reinforcing.
5. Place grout in accordance with ACI 530.1 Specification for Masonry Structures.

I. Control and Expansion Joints:
1. Install control [and expansion] joints at the following maximum spacings, unless otherwise indicated on Drawings:
a. Exterior Walls: Minimum 24 feet on center and within 24 inches on one side of each interior and exterior corner. See Structural and Architectural Drawings.
b. Interior Walls: 32 feet on center.
c. At changes in wall height.
2. Do not continue all horizontal joint reinforcement through control [and expansion] joints.
3. Form control joint with sheet building paper bond breaker fitted to one side of hollow contour end of block unit. Fill resultant elliptical core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

J. Built-In Work:
1. As work progresses, install built-in metal door and glazed frames, fabricated metal frames, window frames, wood nailing strips, fireplace accessories, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.
2. Install built-in items plumb and level.
3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout or mortar.
4. Do not build in materials subject to deterioration.

K. Cutting And Fitting:
1. Cut and fit for chases pipes conduit sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
2. Obtain Architect/Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

L. Install Work in accordance with the State of California's Public Works standards and DSA IR 21-2 and 21-4.

3.04 ERECTION TOLERANCES

A. Maximum Variation From Alignment of Columns: Pilasters: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wali: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

H. Maximum Variation for Steel Reinforcement:
1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.

2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
3. Plus or minus 1 inch when distance is between 8 and 24 inches.
4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
5. Plus or minus 2 inches from location along face of wall.

3.05 FIELD QUALITY CONTROL

A. Concrete Masonry Units: Test each type in accordance with ASTM C140.

3.06 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.07 PROTECTION OF FINISHED WORK

A. Protect exposed external corners subject to damage.

B. Protect base of walls from mud and mortar splatter.

C. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.

D. Protect tops of masonry work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when work is not in progress.

3.08 GROUTING APPROACHES

A. Low-lift grouting: Low-lift grouted construction shall comply with Building Code Requirements and Specification for Masonry Structures (TMS 402-08/ACI 530-08/ASCE 5-08), Sec. 1.19, and CBC 2010, Sec. 2104A.5.1.2.2.

B. High-lift grouting: High-lift grouted construction shall comply with Building Code Requirements and Specification for Masonry Structures (TMS 402-08/ACI 530-08/ASCE 5-08), Sec. 1.19, and CBC 2010, Sec. 2104A.5.1.2.3. In addition, it shall also comply with DSA IR 21-2.10.

END OF SECTION

SECTION 04 30 16
ADHERED MASONRY VENEER SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Complete masonry veneer installation system (MVIS) including:
   1. Cement Board
   2. Waterproof air barrier system
   3. Installation materials including adhesives, mortars, pointing mortars, and sealants
   4. Masonry: Thick veneer, 5/8” maximum thickness

1.02 RELATED REQUIREMENTS

A. Section 07 27 26 - Gypsum Air and Vapor Barrier Sheathing System: substrate to cement board

1.03 REFERENCES

A. ANSI A118 - Specifications for the Installation of Ceramic Tile.

B. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

C. ASTM C794 - Standard Test Methods for Adhesion in Peel of Elastomeric Joint Sealants.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM C1325 - Standard Specification for Non Asbestos Fiber Mat Reinforced Cementitious Baker Units.

F. ASTM D751- Standard Test Methods for Coated Fabrics

G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

H. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials

I. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials

J. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

K. ICC-ES AC 376: Acceptance Criteria for Reinforced Cementitious Sheets used As Wall Sheathing and Floor Underlayment

L. ICC-ES AC 212: Acceptance Criteria for Water-Resistive Coatings used as Water-Resistive Barriers on Exterior Sheathing.

1.04 REGULATORY REQUIREMENTS

A. Per CBC 1410.2.1, veneer shall develop a bond to the backing in accordance with The Masonry Society's document TMS 402, section 12.3.2.4.
   1. Not less than two shear tests shall be performed for the adhered veneer between the units and the supporting element. At least one sheer test shall be preformed at each building for each 5,000 square feet of floor area or fraction thereof.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: At the Project site a minimum of one week prior to commencing Adhered Masonry Work.

1.06 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures

B. Manufacturer Warranty: Submit project specific letter of intent to provide specified warranty of installation system.

C. Product Data: Submit current product literature for each product used in assembly.

D. Manufacturers recommended installation procedures.

E. Samples: Masonry and Mortar selection.

F. Reports:

1. Third party building code evaluation report indicating cement board is approved for use in exterior application in accordance with ICC-ES AC 376.

1.07 QUALITY ASSURANCE

A. Mock-ups
   1. Adhered masonry mock-up shall incorporate surrounding construction, including wall assembly, fasteners, flashing, and other related accessories installed in accordance with manufacturer's installation methods.
      a. Mock-up: Provide a 3' x 3' x 3' corner mock-up with control joint and grade termination condition.

1.08 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01 60 00 Product Requirements

B. Protect masonry to prevent staining, chipping, spalling or contamination caused by water, freezing, foreign matter, and other adverse conditions.

C. Store installation materials in a dry location, in accordance with manufacturers' recommendations.

1.09 FIELD CONDITIONS

A. Comply with manufacturers requirements, during installation and for a minimum of seven days after completion of adhered masonry work.

B. Prevent carbon dioxide damage to cementitious products.

1.10 WARRANTY

A. Provide manufacturer 15 Year Warranty for the Exterior Cement Board Supported Adhered Masonry Veneer wall assembly

PART 2 - PRODUCTS

2.01 CEMENT BOARD

A. Manufacturers:
   1. Bases of Design: National Gypsum Company, Charlotte, NC
   2. Request for substitutions will be considered in accordance with the provisions of section 01 63 00 - Product Substitution Procedures.

B. Product: PermaBase
   1. Characteristics:
      a. Manufactured in accordance with ASTM C1325 and ANSI 118.9
      b. Shear Bond Strength: greater than or equal to 200 psi, when tested in accordance with ANSI 118.4
      c. Approved for exterior use in accordance with ICC-ES AC 376
      d. Mold resistant panel score of 10 when tested in accordance with ASTM D3273
      e. Core consisting of cement, polystyrene beads and aggregates. Both faces to have embedded fiberglass mesh.
      f. Face Finish:
         1) Unexposed face: smooth finish
         2) Exposed face: cementitious finish
      g. Moisture absorption of less than 8 percent when tested in accordance with ASTM C473.
      h. Thickness: 1/2 inch

C. Accessories
   1. Tape: PermaBase Tape, 4 inch wide polymer-coated (alkali resistant) mesh tape].
   2. Fasteners: PermaBase No. 8 Drill point screws wafer head, corrosion-resistant, Type S-12 screws or equivalent, complying with ASTM C1002. Minimum 1-5/8 inches long.

2.02 WATERPROOFING AND AIR BARRIER

A. Manufacturers:

1. Base of Design: LATICRETE International, Inc., Bethany CT
2. Request for Substitutions will be considered in accordance with the provisions of section 01 63 00 Product substitution procedures.

B. Product: Laticrete Air and Water Barrier
   1. Characteristics:
      a. Single component, load bearing, fluid applied, waterproofing, crack isolation, air barrier membrane.
      b. Water Vapor Permeance: Class II vapor permeable; 1 perm or less when tested in accordance with ASTM E96 Procedure B.
      c. Water Penetration of openings: Passes when tested in accordance with ASTM E331
      d. Fastener Sealabillity: Passes when tested in accordance with ASTM D1970.
      e. Racking Shear Test: Passed when tested in accordance with ASTM E72
      f. Air Permeance: Passes when tested in accordance with ASTM E2178 and ASTM E2357.

2.03 INSTALLATION MATERIALS

A. LATICRETE Polymer Fortified Veneer Mortar
   1. LATICRETE MVIS Hi-Bond Masonry Veneer Mortar
      a. Latapoxy 300 Adhesive (part of Hi-Bond Masonry Veneer Mortar assembly)
   2. Characteristics:
      a. Preblended and Bagged Latex-Portland Cement Mortar
      b. Weather, frost, shock resistant, and non-flammable
      c. Compressive strength per ASTM C270: greater than or equal to 2400 psi when tested in accordance with ASTM C109.
      d. Shear Bond Strength: greater than or equal to 450 psi when tested in accordance with ANSI A118.4
      e. Sag on Wall: 0.0 inch (0.5 mm) in accordance with ISO 13007.

B. Pointing Mortar
   1. LATICRETE MVIS Masonry Pointing Mortar
   2. Characteristics:
      a. Compressive Strength: Minimum 3000 psi in accordance with ASTM C91
      b. Color: To be selected by Architect from actual samples.

C. Potable Water

2.04 MASONRY VENEER

A. Manufacturers:
   1. Bases of Design: Pacific Clay
      a. Supplier Contact: Douglas R Pearson, DPearson@ResourceBuildingMaterials.com, 949-283-8511
   2. Acceptable Manufacturers subject to meeting the requirements of this section:
      a. Belden Brick, www.beldenbrick.com, (330) 451-2031
      b. Glen-Gery, www.glengery.com, (610) 374-4011
      c. H.C. Muddox Interstate Brick, www.hcmuddox.com., (800) 776-1244
   3. Obtain Thin Brick from a single source

B. Characteristics:
   1. Type: Thin brick veneer
   2. Color: Cambria
   3. Texture: Velour
   4. Size: Norman 5/8” x 2 1/4” x 11 5/8”
   5. Shapes: 90 Degree Corner; 3 5/8" return
   6. Maximum allowable Veneer Unit Weight: 15 psf.
   7. Compressive Strength: 5 sample avg. 2,200 psi. 1500 psi minimum for individual unit.
   8. Shear Bond Strength Between Stone Unit, Latex-Portland Cement Mortar, and Cement Substrate: greater than or equal to 300 psi when tested in accordance with ANSI A118.4

9. Freeze/Thaw: ASTM C67, no disintegration and less than 3 percent weight loss.

2.05 WATERPROOF AIR BARRIER ACCESSORY PRODUCTS

A. Flashing Mortar
   1. LATAPOXY Waterproof Flashing Mortar
   2. Characteristics
      a. Epoxy based, 3-component, trowel applied, waterproofing and vapor barrier membrane for seams, joints, and openings.
      b. Breaking Strength: greater than 170 psi in accordance with ANSI A118.10
      c. Waterproofness: no moisture penetration after 48 hours in accordance with ANSI A118.10
      d. Shear bond strength after 7 days: greater than 50 psi in accordance with ANSI A118.10.

B. Joint Sealant
   1. LATICRETE MVIS Silicone Sealant
   2. Characteristics
      a. Single component, neutral cure, 100% silicone sealant.
      b. In accordance with ASTM C920: Type S, Grade NS, Class 25, Use NT, I, M, and G.
      c. Tensile Strength: 280 psi when tested in accordance with ASTM C794
      d. Hardness per ASTM D751Shore A: 25 (colored sealant); 15 (clear sealant)
      e. Weather Resistance (QUV Weatheromerter): no change in 10000 hours

C. Transition/Expansion Control Material
   1. LATICRETE Waterproofing/Anti-Fracture Fabric
   2. LATICRETE Flexible Sealing Tape
   3. LATICRETE Transition Tape

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify wall assembly has been installed in accordance with Contract Documents.

3.02 CEMENT BOARD INSTALLATION

A. Fasten PermaBase Cement Board horizontally or vertically through sheathing and waterproof air barrier into framing.
   1. Penetrate steel studs a minimum of 3/8 inch (9.53mm) with fastener.
   2. Space fasteners 8 inches (20 cm) on center maximum along perimeter and in field of cement board unless noted otherwise.
   3. Place fasteners a minimum of 3/8 inch (9.53 mm) and a maximum of 5/8 inch (16 mm) from the cement board edge.
   4. Drive fastener heads flush with the face of the cement board.

B. Stagger vertical joints of the cement board. Locate joints over framing members.

C. Offset horizontal joints in cement board a minimum of 12 inches (30.48 cm) from horizontal joints in sheathing.

D. Offset vertical joints in cement board a minimum of one stud space from vertical joints in sheathing.

E. Offset joints in cement board a minimum of 8 inches from the corners of openings by "L" cutting cement board around openings.

F. Treat cement board joints and corners with 4” wide alkali-resistant fiberglass mesh tape imbedded in LATICRETE® Polymer Fortified Veneer Mortar. Allow the taping treatment to cure for 12 to 24 hours at 70º F (21 ºC).

3.03 SUBSTRATE TOLERANCES

A. Maximum deviation in plane: Not to exceed 1/4 inch (6.35 mm) in 10 feet (3.05m), with not more than 1/16 inch (1.6 mm) variation in 1 foot (.305 m)

3.04 APPLICATION OF WATERPROOF AIR BARRIER

A. Joint and opening preparation
   1. Fill thru wall gaps, openings, voids, and penetrations with foam backer rod.
   2. Flash packed gaps with LATAPOXY Waterproof Flashing Mortar
      a. Wet film thickness 1-3 mm (40-125 mils).
   3. Tape and fill in-plane joints and seams 1/8 inch to 1/4 inch wide (3.175 mm - 6.35 mm), to a smooth finish with LATICRETE Polymer Fortified Veneer Mortar. Cure for 24 hours.
   4. Apply one coat of LATICRETE Air & Water Barrier to change of plane transitions, inside and outside corners. Embed 6 inch (15.24 mm) wide LATICRETE Waterproofing/Anti-Fracture Fabric and coat with a second coat of LATICRETE Air & Water Barrier using a roller, brush, or trowel.
      a. Wet coat thickness: 15-22 mils.
   5. Allow prepared joints, seams and openings to dry.

B. Main Waterproof Air Barrier Application
   1. Apply continuous application of LATICRETE Air & Water Barrier over substrate, treated joints, and seams. Allow to dry to the touch.
      a. Wet coat thickness: 15-22 mils
      b. Bring application of LATICRETE Air & Water Barrier up to penetrations
   2. Apply second coat of LATICRETE Air & Water Barrier and allow to dry to the touch. Wet coat thickness: 15-22 mils.
   3. Examine coated surface for pinholes, voids, thin-spots and other defects, reapply LATICRETE Air & Water Barrier to provide uniform coat.

C. Penetration Treatment
   1. Flash LATAPOXY Waterproof Flashing Mortar onto the penetration and onto the cured LATICRETE Air & Water Barrier. Overlap a minimum of 2 inches (50.8 mm).

3.05 INSTALLATION OF THIN BRICK TO THE SUBSTRATE

A. Unless recommended otherwise by the masonry veneer manufacturer. Key uniform layer of LATICRETE Polymer Fortified Veneer Mortar to cement board substrate.

B. Comb additional mortar onto substrate with mortar manufacturer recommended notched trowel.

C. Back butter veneer units 8 inches by 8 inches and larger to provide full bedding of the veneer.

D. Place veneer into the mortar and adjust to desired position.

E. Clean excess extruded mortar

3.06 MASONRY POINTING

A. Allow adhered masonry veneer to cure a minimum of 24 hours at 70 degrees F.

B. Verify grout joints are free of dirt and debris, and remove any water standing in joints.

C. Install pointing mortar to desired depth, ensuring mortar is forced into voids.

D. Cure to “thumbprint” hardness and trowel, rake, or brush joint to concave.

3.07 FINISHING PENETRATIONS THROUGH ADHERED MASONRY

A. Install closed cell backer rod in deep joints and bond breaker tape on shallow joints

B. Protect veneer face by masking surface

C. Apply LATICRETE MVIS Silicone sealant into joint or gap, filling completely.

D. Finish joint for a smooth finish, ensuring sealant contact with sides of joint.

E. Remove masking and clean veneer surface.

3.08 CLEANING

A. Clean completed adhered masonry work after mortar is set in accordance with masonry and mortar manufacturers’ recommended practices.

END OF SECTION 04 30 16

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Grout.

1.02 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.03 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that is approved by the City of Los Angeles as an approved fabricator of structural steel.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel" & AWS D1.8.

C. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 360.
   3. AISC 341.

PART 2 - PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992

B. Channels, Angles: ASTM A 36

C. Plate and Bar: ASTM A 36

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.02 THREADED FASTENERS

A. Machine Bolts: Unless noted otherwise, ASTM A307, Grade A. Provide ASTM A563, Hex, Grade A Nuts and ASTM F 436 Washers

2.03 PRIMER

A. Approved VOC complaint primer, suitable for subsequent finishes as specified and shown in other portions of the Contract Documents.

2.04 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.05 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

2.06 SHOP CONNECTIONS

A. Retain option in "Weld Connections" Paragraph below for "High-Seismic Applications" as defined in AISC 360.

2.07 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."
   3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.08 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M

2.09 HOT-DIPPED GALVANIZED

A. Structural steel shall be Hot-dipped galvanized after Fabrication, where steel and connectors are exposed to weather or as noted on Structural Drawings.
   1. Steel framing members and ferrous metal items, specifically shown or noted on drawings as galvanized, shall be galvanized by the hot-dip process, conforming to ASTM A 123, Grade 75.
   2. Steel connection components, including bolts, washers and nuts, shall be galvanized by the hot-dip process conforming to ASTM A 153.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedment’s for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates: Clean -bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.03 FIELD CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
   3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.04 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M & AWS D1.8.

END OF SECTION 05 12 00

SECTION 05 12 13
ARCHITECTURALLY-EXPOSED STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing

B. Section 05 31 00 - Steel Decking

C. Section 05 50 00 - Metal Fabrications

D. Section 09 96 00 - High-Performance Coatings

1.03 DEFINITIONS

A. Architecturally-Exposed Structural Steel: Structural steel complying with designated AESS category as defined in AISC 303.

1.04 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2022.

B. AISC 360 - Specification for Structural Steel Buildings 2022.

C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling 2022.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2020.

G. ASTM A1085/A1085M - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS) 2015.

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

K. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

L. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Schedule and conduct a preinstallation meeting at project site one week prior to start of work of this section; require attendance by all affected installers. Coordinate requirements for shipping, special handling, storage, attachment of safety cables and temporary erection bracing, final coating, touch-up painting, mock-up coordination, Architect's observations, and other requirements for AESS.

1.06 SUBMITTALS

A. See Section 01 33 00 - Submittal Proceedures

B. Product data for each type of product specified. Submit paint systems in accordance with Section 09 91 13.

C. Shop Drawings: Detailing for fabrication of AESS components.

1. Provide erection documents clearly indicating which members are AESS members and the AESS category of each part.
2. Include details that clearly identify AESS requirements found in this specification. Provide connections for AESS consistent with concepts shown on drawings.
3. Indicate welds by AWS A2.4 symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined by the designated AESS category.
4. Indicate orientation of hollow structural section (HSS) seams and mill marks (where applicable).
5. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate orientation of bolt heads.
6. Indicate which surfaces or edges are exposed and what class of surface preparation is being used.
7. Indicate special tolerances and erection requirements as noted on drawings or defined by the designated AESS category.
8. Indicate vent or drainage holes for HSS members.

D. AESS 1, AESS 2, AESS 3, AESS 4, and AESS C Samples: Provide samples of specific AESS characteristics. Samples may be small size samples or components of conventional structural steel demonstrating specific AESS characteristics, including surface preparation, sharp edges ground smooth, continuous weld appearance, weld show through, and fabrication mark removal.

E. Qualification data for fabricator and erector to demonstrate their capabilities and experience. Include lists of completed projects names and address, names and addresses of architects and owners, photographs showing detail of installed AESS, and other information specified.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: In addition to those qualifications listed in Section 05 12 00, engage an AISC Certified Fabricator, experienced in fabricating AESS similar to that indicated for this project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the work.

B. Erector Qualifications: In addition to those qualifications listed in Section 05 12 00, engage an AISC Certified Erector, experienced in erecting AESS work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

C. Comply with applicable provisions of AISC 303, Section 10 for the designated AESS category.

D. Owner to engage a quality assurance agency per requirements of AISC 360, Chapter N and AISC 303, Section 10.

E. Contractor to engage a quality assurance agency per requirements of AISC 360, Chapter N and AISC 303, Section 10.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle finished pieces in accordance with Section 10 of AISC 303, using nylon-type slings, or chains with softeners, or wire ropes with softeners such that they are not damaged.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Comply with Section 05 12 00, except as amended in this section for aesthetic purposes.

B. Comply with AISC 303, Section 10 for specific AESS category designated on drawings.

C. Comply with AISC 303, Section 10 for specific AESS as follows:
1. Category : AESS 3: Feature Elements in Close View.

2.02 FABRICATION

A. Fabricate and assemble AESS in shop to greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by Architect. Detail AESS assemblies to minimize field handling and expedite erection.

B. Permissible tolerances for member depth, width, out of square, and camber and sweep to be as specified in ASTM A6/A6M, ASTM A500/A500M, and ASTM A1085/A1085M.

C. For curved structural members, whether composed of a single standard structural shape or built-up, the as-fabricated variation from theoretical curvature to be equal to or less than standard camber and sweep tolerances permitted for straight members in applicable ASTM standard.

D. Use special care in handling and shipping of AESS both before and after shop painting to minimize damage to any shop finish. Use nylon-type slings or softeners when using chains or wire rope slings.

E. Bolted Connections:
   1. Make in accordance with Section 05 12 00. Provide bolt type and finish as noted herein.

F. Welded Connections:
   1. Comply with AWS D1.1 AWS D1.4 and Section 05 12 00.
   2. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding tolerances of this section.

G. Surface Preparation:
   1. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
   2. Remove backing and run out tabs.

H. Fabricate AESS in accordance with categories defined in AISC 303, as follows:
   1. AESS 1: Basic elements.
   2. AESS 2: Feature elements viewed at a distance greater than 20 feet (feature elements not in close view).
   3. AESS 3: Feature elements viewed at a distance less than 20 feet (feature elements in close view).
   4. AESS 4: Showcase elements with special surface and edge treatment beyond fabrication (showcase elements).

2.03 PAINT SYSTEM

A. Compatibility: All components/procedures of AESS paint system to comply with coating system specified, submitted, and approved per Sections 09 91 13, 09 91 23, and 09 96 00. As a minimum, identify required surface preparation, primer, intermediate coat (if applicable), and finish coat. Primer, intermediate coating, and finish coating to be from a single manufacturer combined in a system documented by manufacturer with adequate guidance for fabricator to procure and execute.

B. Shop application at time steel products are fabricated:
   1. Tnemec Series 94-97 Tneme-Zinc, two-component catalyzed epoxy coating at 2.5-3.5 mils DFT.
   2. Galvanized steel: Tnemec Series L69 Epoxoline, two-component catalyzed epoxy coating at 2-3 mils DFT.

C. Primer: As specified in Section 09 91 13, 09 91 23, and 09 96 00. Primer to comply with all federal standards for VOC, lead and chromate levels.

D. Finish Coating: Field apply intermediate and top coats per Section 09 91 13, 09 91 23, and 09 96 00.

2.04 SHOP PRIMING

A. Surface Preparation:
   1. Provide surface preparations to meet SSPC-SP 6.

2. Coordinate required surface profile with approved paint submittal prior to beginning surface preparation.
3. Prior to blasting, remove any grease and oil using solvent cleaning to meet SSPC-SP 1.
4. Remove weld spatter, slivers and similar surface discontinuities.
5. Ease sharp corners resulting from shearing, flame cutting or grinding.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted with slip-critical connections.
1. Extend priming of members partially embedded in concrete or mortar to a depth of 2 inches.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop primer to surfaces that are inaccessible after assembly or erection.

2.05 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by hot-dip process to AESS indicated for galvanizing according to ASTM A123/A123M. Fabricate such that all connections of assemblies are made in the field with bolted connections where possible.

2.06 MATERIALS

A. General: Meet requirements of 05 12 00 as amended below.

B. Tension Control, High-Strength Bolts, Nuts, and Washers: Per section 05 12 00, Tension Control Bolts. Provide standard carbon steel finish rounded bolt heads with twist off bolts; ASTM F3125/F3125M.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Structural Requirements:
1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 12 00 for additional requirements.
2. Quality assurance agency to review work for compliance with requirements of AISC 360, Chapter N and AISC 303, Section 10.

C. AESS 1 and 2 Acceptance: Architect to observe AESS in the shop at a viewing distance consistent with final installation and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

D. AESS 3,4, and C Acceptance: Architect to observe AESS in the shop at a viewing distance consistent with final installation and determine acceptability based on approved mock-up. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Erector to check all AESS members upon delivery for twist, kinks, gouges or other imperfections which may result in rejection of appearance of member. Coordinate remedial action with fabricator prior to erecting steel.

3.02 PREPARATION

A. Provide connections for temporary shoring, bracing and supports only where noted on approved fabrication documents. Temporary connections not shown are to be made at locations not exposed to view in final structure or as approved by Architect.

B. Handle, lift and align pieces using nylon straps or chains with softeners required to maintain appearance of AESS through process of erection.

3.03 ERECTION

A. AESS 1 and 2: Basic elements; feature elements not in close view:
   1. Employ special care to handle and erect AESS. Erect finished pieces using nylon straps or chains with softeners such that they are not damaged.
   2. Place weld tabs for temporary bracing and safety cabling at points concealed from view in completed structure or where approved by Architect during pre-installation meeting. Obtain Architect approval of methods for removing temporary devices and finishing AESS members prior to erection.
   3. AESS Erection Tolerances: Erect to standard frame tolerances for structural steel per Chapter 7 of AISC 303.
   4. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
   5. Remove blemishes or unsightly surfaces resulting from temporary braces or fixtures.
   6. Remove all backing and run out tabs.
   7. When temporary braces or fixtures are required to facilitate erection, take care to avoid any blemishes, holes or unsightly surfaces resulting from use or removal of such temporary elements.
   8. Bolted Connections: Align bolt heads on same side of connection as indicated on approved fabrication or erection documents.
   9. Welded Connections: Comply with AWS D1.1/D1.1M and Section 05 12 00. Appearance and quality of welds to be consistent. Employ methods that will maintain alignment of members without warp exceeding tolerance of this section.
   10. Remove weld spatter exposed to view.
   11. Grind off projections larger than 1/16 inch at field butt and plug welds.
   12. Continuous Welds: Where continuous welding is noted on drawings, provide continuous welds of a uniform size and profile.
   13. Do not enlarge holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.
   14. Splice members only where indicated.
   15. Obtain permission for any torch cutting or field fabrication from Architect. Finish sections thermally cut during erection to a surface appearance consistent with mock-up.

B. AESS 3: Feature elements in close view:
   1. Erect to requirements of AESS 1 and 2 and as follows:
   2. Field Welding: Weld profile, quality, and finish to be consistent with mock-ups approved prior to fabrication.
   3. Provide a continuous appearance to all welded joints including tack welds. Provide joint filler at intermittent welds.

C. AESS 4: Showcase elements:
   1. Erect to requirements of AESS 3 and as follows:
   2. Grind welds smooth.
   3. Minimize Weld Show Through: At locations where welding on far side of an exposed connection creates distortion, grind distortion and marking of steel to a smooth profile with adjacent material.
   4. Filling of Weld Access Holes: Where holes must be cut in web at intersection with flanges on W shapes and structural tees to permit field welding of flanges, fill holes with joint filler.
   5. Where welds are indicated to be ground, contoured, or blended, oversize welds as required and grind to provide a smooth transition and match profile on approved mock-up.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Structural Requirements:
   1. Comply with quality control requirements per AISC 360, Chapter N and AISC 303, Section 10. Refer to Section 05 12 00 for additional requirements.

2. Quality assurance agency to review work for compliance with requirements of AISC 360, Chapter N and AISC 303, Section 10.

C. AESS 1 and 2 Acceptance: Architect to observe AESS in place and determine acceptability based on qualification data and submittals. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

D. AESS 3,4, and C Acceptance: Architect to observe AESS in place and determine acceptability based on qualification data and submittals as well as on approved mock- up. Quality assurance agency has no responsibility for enforcing requirements related to aesthetic effect.

3.05 CLEANING

A. Touch-up Painting: Complete cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint to blend with adjacent surfaces of AESS. Perform touch-up work in accordance with manufacturer's instructions

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas. Repair galvanized surfaces in accordance with ASTM A780/A780M.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches (450 mm) and shear stud connectors.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2013.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

F. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2008.

G. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.

H. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.

I. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

A. See Section 01 33 00 - Submittals Procedures.

B. Shop Drawings: Indicate deck plan, support locations, projections, openings, pertinent details, and accessories.

C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

D. Submit manufacturer's installation instructions.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 3 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Verco Decking, Inc.: www.vercodeck.com <http://www.vercodeck.com/>

2.02 STEEL DECK

A. Bare Roof Deck: Non-composite type, fluted steel sheet as scheduled on drawings:

1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 40/275, with G90 galvanized coating with Gray Primer Paint on bottom side of deck.
2. Structural Properties: as indicated on drawings.
3. Side Joints: Verco punchlok.
4. End Joints: Lapped, welded.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel.

B. Welding Materials: AWS D1.1.

C. Flute Closures: Closed cell foam rubber, 1 inch (25 mm) thick; profiled to fit tight to the deck.

D. Acoustical Flute Insulation: Encapsulated 0.75pcf Fiberglass

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, and cover plates, 20 gage (0.9 mm) thick sheet steel; of profile and size as indicated; finished same as deck, unless otherwise indicated.

B. Roof Sump Pans: 14 gage (1.8 mm thick) sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches (38 mm) below roof deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On steel supports provide minimum 2 inch (51 mm) bearing.

C. Fasten deck to steel support members at ends and intermediate supports at as indicated on drawings.

D. Punch seam side laps, spacing as indicated on drawings.

E. Weld deck in accordance with AWS D1.3.

F. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

G. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

H. Place metal cant strips in position and fusion weld.

I. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

J. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 40 00
COLD-FORM METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

C. Water-resistive barrier over sheathing.

1.02 RELATED REQUIREMENTS

A. Section 07 21 00 - Thermal Insulation.

B. Section 07 62 00 - Sheet Metal Flashing and Trim.

C. Section 07 92 00 - Sealants and Caulking.

D. Section 09 24 00 - Portland Cement Plaster

E. Section 09 21 16 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2007 with 2010 supplement. (replaced SG-971)

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2013.

E. 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; 2013.

F. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.

G. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2013.

H. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.

I. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

J. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2013.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

M. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2008.

N. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc.; 2013.

O. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and

firestopping.

1.05 SUBMITTALS

A. See Section 01 33 00- Submittal Procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, and limitations.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07 MOCK-UP

A. Provide mock-up of exterior framed wall, including components specified elsewhere, such as insulation, sheathing, window frame, door frame, exterior wall finish, and interior wall finish.

B. Mock-Up Size: As required to demonstrate all conditions, including corner condition.

C. Location: As directed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. Clarkwestern Dietrich Building Systems LLC; www.clarkdietrich.com. <http://www.clarkdietrich.com/>
   2. Marino; www.marinoware.com. <http://www.marinoware.com/>
   3. The Steel Network, Inc; www.SteelNetwork.com. <http://www.SteelNetwork.com/>

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing, or as indicated on drawings.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Gage and depth: As indicated on the drawings.
   2. Galvanized in accordance with ASTM A653/A653M G90/Z275 coating.
   3. Provide components fabricated from ASTM A1008/A1008M, Designation SS steel.

2.04 WALL SHEATHING

A. Wall Sheathing: See Section 09 21 16 Gypsum Board Assemblies.

B. Wall Sheathing: Gypsum; complying with requirements of ASTM C1396/C1396M for gypsum sheathing, V-shaped long edges, 5/8 inch Type X fire-resistant.

C. Wall Sheathing: Glass mat faced gypsum; ASTM C1177/C1177M, square long edges, 5/8 inch Type X fire-resistant.

2.05 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness as indicated on drawings; finish to match framing components.

B. Plates, Gussets, Clips: Formed Sheet Steel, thickness as indicated on drawings; finish to match framing components.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.06 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
   1. Products:
      a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series; www.ITWBuildex.com. <http://www.ITWBuildex.com/>

B. Anchorage Devices: Powder actuated, Drilled expansion bolts, and threaded concrete anchors.

C. Welding: In conformance with AWS D1.1 and AWS D1.3.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and building framing components are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Install load bearing studs full length in one piece. Splicing of studs is not permitted, unless otherwise indicated.

C. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

D. Install intermediate studs above and below openings to align with wall stud spacing.

E. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

F. Attach track backing to studs for attachment of fixtures anchored to walls.

G. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

H. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 WALL SHEATHING

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
   2. Provide steel diagonal bracing at corners.
   3. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/4" inch.

B. Maximum Variation of any Member from Plane: 1/4" inch.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabrications - Provide miscellanious metal fabrications completeas indicated, specified, and required. Including but not limited to:
   1. Bollards
   2. Rail Barriers
   3. Utility Enclosure Gates
   4. All other miscellaneous metal fabrications to complete the work

1.02 RELATED SECTIONS

A. Section 01 41 00 - Testing and Inspection.

B. Section 05 51 33 - Metal Ladders

C. Section 09 96 00 - High-Performance Coatings

1.03 REFERENCES

A. AISC - Code of Standard Practice 360-10 - Steel Construction Manual, 14th Edition & AISC 303- 10.

B. ANSI B27.2 - Plain Washers

C. ASTM A27 - Steel Castings, Carbon, for General Application.

D. ASTM A36/A36M - Structural Steel.

E. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.

F. ASTM A120 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses.

G. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

H. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates.

I. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.

J. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

K. AWS D-1.1 - Welding in Building Construction.

L. L. AWS A2.4 - Symbols for Welding, Brazing, and Nondestructive Examination.

M. SSPC (Steel Structures Painting Council) - Painting Manual.

N. T24, CCR - Title 24, California Code of Regulations.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00: Submittal Procedures.

B. Submit shop drawings indicating materials used, dimensions, anchoring details, and adjacent construction.

C. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Perform all work in accordance with references.

1.06 PRODUCT HANDLING

A. Store miscellaneous metal items above ground on platforms, skids or other approved supports.

B. Protect metals from corrosion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes: Conform to ASTM A36.

B. Steel Pipe: Steel pipe other than pipe used for structural purposes shall conform to ASTM A120, or ASTM A53, Fy = 35 ksi.

C. Square and Rectangular Steel Tubing: Steel tubing other than tubing used for structural purposes shall be carbon steel conforming to ASTM A500. Fy = 46 ksi.

D. Cast Steel: Conform to ASTM A27, Grade 65-35.

E. Steel Bolts and Washers: ASTM A307, Grade A. Plain Washers: ANSI B27.2.

F. Rolled Steel Plates and Shapes:
   1. Shapes and plates shall conform to ASTM A36, except for plates to be bent or cold-formed.
   2. Plates to be bent or cold-formed shall conform to ASTM A283, Grade C.

G. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.02 FABRICATION

A. General:
   1. For fabrication of items which will be exposed to view, use only materials which are smooth and free of blemishes. Remove blemishes by grinding or by welding and grinding, prior to cleaning, treating and application of surface finishes including zinc- coatings.
   2. Form exposed work true to line and level with accurate angles and surfaces, and straight sharp edges.
   3. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated or specified.
   4. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
   5. Form exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible.
   6. Remove loose rust, mill scale, cutting and punching burrs.
   7. Fabricate items in as large sections as practical to minimize field jointing.

B. Miscellaneous Framing and Supports: Provide miscellaneous steel framing and supports that are not a part of structural steel framework, as required to complete work.
   1. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of necessary dimensions to receive adjacent work to be retained by framing.
   2. Shelf angles for exterior construction shall be galvanized steel of sizes indicated.

C. Welding:
   1. Weld connections in the shop, unless indicated or specified otherwise.
   2. Weld corners and seams continuously and in accordance with requirements of AWS Code. Welds shall be inspected as indicated in 01 41 00 - Testing and Inspection.
   3. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Galvanizing:
   1. Galvanizing shall conform to requirements of ASTM A123.
   2. Items to be galvanized shall be hot-dip galvanized in as large sections as possible.
   3. Treatment for damaged galvanized surfaces shall be Galvalloy, Galvabar, Galvicon, Drygalv or equal. Comply with ASTM A780.

E. Shop Finish:
   1. Miscellaneous metal fabrications which will be exposed when building is completed shall receive a coat of primer.
   2. Shop application at time steel products are fabricated:
      a. Plain steel: Tnemec Series 94-97 Tneme-Zinc, two-component catalyzed epoxy coating at 2.5-3.5 mils DFT.

b. Galvanized steel: Tnemec Series L69 Epoxoline, two-component catalyzed epoxy coating at 2-3 mils DFT.

3. Preparation for Painting: Miscellaneous ferrous metal, except items specified galvanized or shop primed, shall be thoroughly cleaned of all mill scale, grease, dirt or rust, by scraping, wire-brushing, or sandblasting and shall be delivered to job unpainted, but in proper condition for painting. Shipping oil or other protective coatings shall be removed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Drinking Fountain Rail Barriers: CBC Section 11B-601
   1. Install as detailed and indicated in Drawings.
   2. When anchorage to horizontal concrete surfaces is not indicated, set standards into metal sleeves cast into concrete, and extending into same not less than 9”. Wedge standards true and plumb and grout in place with non-shrink grout specified in Section 03600 - Grouts. Finish grout smooth and flush with floor surface.
   3. Where anchorage to vertical surfaces is not indicated, weld rail to rectangular or round pipe rail flange, shaped and sized so face of flange will firmly abut the vertical surface. Secure flange to concrete or masonry with 3/8 inch diameter wedge anchor bolts. Secure flange to wood framing with 3/8 inch diameter lag screws, unless otherwise indicated. Embedment to be 2-1/2 inches or greater. Secure flange to steel framing with 3/8 inch diameter machine bolts, unless otherwise indicated.

B. Enclosure Gates
   1. Fabricate as detailed, frame and support posts to be galvanized steel tube and angles, continuously weld joints and grind smooth and flush. Cover with materials as detailed on drawings, paint to match building or color(s) as selected by Architect. Provide hinges, latches, draw bolts, cane bolts and embedded items as required.

C. Pipe Bollards
   1. Fabricate as detailed on drawings using heavy weight galvanized steel pipe set into concrete and filled, round concrete at top to shed water. Provide Luminis MA30 series lighted bollards where indicated on the drawings.

D. Miscellaneous Fabrications: Install and secure to structure as required to ensure component will support all loads anticipated, identified, or required by T24, CCR, and to result in a complete installation.

3.02 REPAIR OF DAMAGED GALVANIZED SURFACES

A. Repair galvanized finish damaged or burned off in welding.

END OF SECTION

SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated aluminum access ladders.

1.02 RELATED REQUIREMENTS

A. Section 07 72 00 - Roof Accessories: Roof Hatch & Safety Post for Ladders

1.03 REFERENCE STANDARDS

A. OSHA 1910.27 – Fixed Ladders.

B. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2019.

1.04 SUBMITTALS

A. Provide in accordance with Section 01 33 00 - Submittal Procedures:

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 FIXED ACCESS LADDERS

A. Bases of Design Manufacturer:
   1. O'Keeffe's Inc: www.okeeffes.com
      a. Roof Hatch Access Ladder; Model 501
      b. Low Roof to High Roof Ladder with crossover platform; Model 503

B. Acceptable Manufacturers:
   1. Alaco Ladder Company: www.alacoladder.com
      a. Roof Hatch Access Ladder; Model 560
      b. Low Roof to High Roof Ladder with crossover platform; Model 564
   2. Or Approved Equal: See Section 01 60 00 - Product Requirements.
      a. Provide in accordance with Section 01 25 10 – Product Options and Substitutions

C. Ladder Width and Height:
   1. Width: 18" minimum clear between side rails
   2. Height: Field verify
      a. Fixed ladders above 24-feet shall include a personal fall arrest system.

D. Fabrication:
   1. Rungs:
      a. Not less than 1-1/8 inches in section and 18–3/8 inches long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
      b. Rungs shall withstand a 1,500 pound (454 kg) load without deformation or failure.
      c. Rungs at 12" equal spacing.
   2. Side Rails:
      a. Heavy duty tubular side rails assembled from two interlocking aluminum extrusions no less than 1/8 inch wall thickness by 3 inches wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
   3. Wall Bracket
      a. 3/16" extruded aluminum, alloy 6061-T6.
   4. Finish:
      a. Clear Anodic Finish: AA-M10C22A41 Mechanical finish as fabricated. Architectural Class I, clear coating 0.018 mm or thicker.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Supply templates to the appropriate entities for locating wall backing for the ladder attachment locations..

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Install ladder in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 05 75 00
DECORATIVE FORMED METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior fabrications made of formed metal sheet, secondary supports, and anchors to structure, including:
   1. Closures, trim, and filler panels.
   2. Mullion cladding.
   3. Pockets for window treatment.
   4. Factory fabricated column covers.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Non-decorative metal fabrications.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Formed metal flashings and trim.

C. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.

C. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum 2020, with Errata (2022).

D. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

I. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

J. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications 2022b.

K. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.

L. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use 2014 (Reapproved 2020).

M. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip 2023.

N. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

O. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.

P. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings 2020.

Q. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process 2022.

R. ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface 2022.

S. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.

T. ASTM B36/B36M - Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar 2018.

U. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

V. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

W. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.

X. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.

Y. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.

Z. ASTM B265 - Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate 2020a.

AA. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction 2022.

BB. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

CC. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

DD. ASTM C834 - Standard Specification for Latex Sealants 2017 (Reapproved 2023).

EE. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

FF. ASTM D523 - Standard Test Method for Specular Gloss 2014 (Reapproved 2018).

GG. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber 2020.

HH. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal 1997 (Reapproved 2018).

II. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives 1998 (Reapproved 2021).

JJ. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics 2020.

KK. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates 2022.

LL. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet 2010 (Reapproved 2022).

MM. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films 2007 (Reapproved 2015).

NN. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

OO. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C 2022.

PP. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements 2022.

QQ. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs 2022.

RR. ASTM F594 - Standard Specification for Stainless Steel Nuts 2022.

SS. ASTM F1941/F1941M - Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric 2016.

TT. AWS C3.4M/C3.4 - Specification for Torch Brazing 2016.

UU. AWS C3.5M/C3.5 - Specification for Induction Brazing 2016, with Amendment (2017).

VV. AWS C3.9M/C3.9 - Specification for Resistance Brazing 2020.

WW. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

XX. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2017, with Amendment (2021).

YY. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2 2017.

ZZ. NAAMM AMP 500-06 - Metal Finishes Manual 2006.

AAA. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components 2023.

BBB. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals 2016.

CCC. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

DDD. SSPC-SP 5 - White Metal Blast Cleaning 2007.

EEE. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic) 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data - Sheet Metal Material: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Product Data - Metal Composite Material (MCM) Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1. Finish manufacturer's data sheet showing physical and performance characteristics.
   2. Storage and handling requirements and recommendations.
   3. Fabrication instructions and recommendations.
   4. Specimen warranty for finish, as specified herein.

D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Show actual field measurements on shop drawings.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the fabrications must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.
   5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than _____ inches per _____ inches.

E. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, minimum size 12 inches square, representing actual product in color and texture.

G. Certificate: Certify that work results of this section meet or exceed specified requirements.

H. Test Report: Submit report of full-size mock-up test for NFPA 285 fire performance.

I. Fabricator's Qualification Statement.

J. Installer’s Qualification Statement.

K. Maintenance Data: Care of finishes and warranty requirements.

L. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating products specified in this section.
   1. With not less than three years of documented experience.
   2. Approved by MCM sheet manufacturer.
   3. Submit contact names and phone numbers for at least three references connected with successful past projects.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. With minimum 3 years of documented experience.
   2. Approved by fabricator.
   3. Submit contact names and phone numbers for at least three references connected with successful past projects.

C. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
   1. Locate where directed.
   2. Provide products finished as specified.
   3. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect finishes by applying heavy duty removable plastic film during production.
   2. Package for protection against transportation damage.
   3. Provide markings to identify components consistently with drawings.
   4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in well-ventilated space out of direct sunlight.
   2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
   3. Store at a slope to ensure positive drainage of accumulated water.
   4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
   5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. MCM Sheet Manufacturer’s Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 5 years:
   1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
   2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
   3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material Sheet Manufacturers:
   1. 3A Composites USA: www.alucobondusa.com/#sle.
   2. ALPOLIC Materials: www.alpolic-americas.com/#sle.
   3. Equal product substitution requests will be considered in accordance with provisions of Section 01 63 00 - Product Substitution Procedures.

B. Solid Metal Plate Material Manufacturers:
   1. Metalwerks; ____: www.metalwerksusa.com/#sle.
   2. _____.
   3. _____.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Factory Fabricated Column Covers:
   1. ATAS International, Inc; ____: www.atas.com/#sle.
   2. DAMS Incorporated; ____: www.damsinc.com/#sle.
   3. SAF Metal Fabrication, a division of Southern Aluminum Finishing Company, Inc; ____: www.saf.com/#sle.
   4. Superior Aluminum Products, Inc; Round Fluted Columns: www.superioraluminum.com/#sle.
   5. _____.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FORMED METAL FABRICATIONS - GENERAL

A. Shop Assembly: Preassemble items to greatest extent possible. Minimize field splices and field assembly. Disassemble only as necessary for transportation and handling. Mark items clearly for assembly and installation.

B. Coordination: Match dimensions and attachment of formed metal items to adjacent construction. Produce integrated assemblies. Closely fit joints; align edges and flat surfaces unless indicated otherwise.

C. Forming: Profiles indicated. Maximize lengths. Fold exposed edges to form hem indicated or ease edges to radius indicated with concealed stiffener. Provide flat, flush surfaces without cracking or grain separation at bends.

D. Reinforcement: Increase metal thickness; use concealed stiffeners, backing materials or both. Provide stretcher leveled standard of flatness and stiffness required to maintain flatness and hold adjacent items in flush alignment.

E. Anchors: Straps, plates and anchors as required to support and anchor items to adjacent construction.

F. Supports: Miscellaneous framing, mounting, clips, sleeves, fasteners and accessories required for installation.

G. Welding and Brazing: Weld or braze joints continuously. Grind, fill or dress to produce smooth, flush, exposed surfaces. Do not discolor metal. Grind smooth, polish, and restore damaged finishes to required condition.
   1. Ease exposed edges to small uniform radius.
   2. Welded Joints:
      a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
      b. Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
   3. Brass/Bronze Brazed Joints:
      a. Perform torch brazing in accordance with AWS C3.4M/C3.4.
      b. Perform induction brazing in accordance with AWS C3.5M/C3.5.
      c. Perform resistance brazing in accordance with AWS C3.9M/C3.9.

H. Performance Requirements:
   1. Thermal Movements:

a. Allow for thermal movements in exterior metal fabrications due to temperature changes. Prevent buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
b. Temperature Change Range: 120 degrees F, ambient; 180 degrees F, on material surfaces.

2. Corrosion: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials.

2.03 FORMED METAL FABRICATIONS - SHEET METAL

A. Closures, Trim and Fill Panels:
1. Form closures from type and thickness of metal indicated.
2. Conceal fasteners when possible.
3. Drill and tap holes for securing to other surfaces.
4. Provide gaskets where indicated or needed for continuous seal at adjacent surfaces.
5. Miter or cope at corners and reinforce with bent metal plate. Form tight joints.

B. Decorative Metal Clad Hollow Metal Doors and Frames: Laminate metal sheets of type and thickness indicated to hollow metal doors and frames.

C. Lighting Coves: Form lighting coves from type and thickness of metal indicated. Provide cutouts for electrical wiring and fasteners. Coordinate size of coves, cutouts and anchoring system with lighting system shown on drawings.

D. Metal Base: Form metal base from type and thickness of metal indicated. Provide integral cove, reveals and other features shown on drawings.

E. Mullion Cladding: Form mullion cladding from type and thickness of metal indicated. Fit tightly to adjacent constructions.

F. Pockets for Window Treatment:
1. Form pockets from metal of type and thickness indicated. Coordinate dimensions and attachment method with window treatment, window frames, ceiling system and other adjacent construction.
2. Reinforce for attaching window treatment and hardware.
3. Divide continuous pockets with built in partitions. Separate adjoining drapery and blind units, align with window mullions and accommodate filler panel at ends of pocket.

2.04 FORMED METAL FABRICATIONS - MCM SHEET

A. MCM Sheet Fabrications, General: Assemble metal panels, fasteners, and anchors in configurations and dimensions shown on drawings.
1. Provide panel jointing using reveal joints and gaskets but no sealant.
2. Anchor panels to supporting framing without exposed fasteners.
3. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.

B. Panels: One inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
1. Reinforce corners with riveted aluminum angles.
2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.
3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
4. Reinforce panels over ___ inches long with metal angle braces 24 inches on center in short direction.
5. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.
6. Metallic Finished Panels: Maintain consistent grain of MCM sheet; specifically, do not rotate sheet purely to avoid waste.
7. Fabricate panels under controlled shop conditions.

8. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.
9. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.
    a. Make panel lines, breaks, curves and angles sharp and true.
    b. Keep plane surfaces free from warp or buckle.
    c. Keep panel surfaces free of scratches or marks caused during fabrication.

2.05 FACTORY FABRICATED COLUMN COVERS

A. Factory Fabricated Column Covers: Factory fabricated and factory finished, sheet metal column covers, mechanically fastened to structural support.
    1. Material: Aluminum sheet, ASTM B209/B209M alloy 3003 or 5005.
    2. Sheet Thickness: 0.125 inch, minimum.
    3. Column Section Length: 12 feet, maximum, between horizontal joints.
    4. Joint Type: Butt.
    5. Horizontal Reveals: Manufacturer's standard; at top, bottom, and center.
    6. Fasteners: Self-drilling; ASTM A449 heat treated steel, with manufacturer's standard corrosion resistant coating.
    7. Aluminum Finish: Manufacturer's standard factory applied PVDF coating.
    8. Stainless Steel Finish: Manufacturer's standard No.4 brushed mechanical finish.
    9. Color: To be selected by Architect from manufacturer's standard range.
    10. Color: _____.
    11. Manufacturers:
        a. DAMS Incorporated; CPSS Series: www.damsinc.com/#sle.
        b. SAF Metal Fabrication, a division of Southern Aluminum Finishing Company, Inc; ____: www.saf.com/#sle.
        c. _____.
        d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Factory Fabricated Column Covers: Factory fabricated and factory finished, solid metal plate column covers, mechanically fastened to structural support.
    1. Material: Manufacturer's standard aluminum plate.
    2. Aluminum: ASTM B209/B209M, alloy 3003-H14, 0.125 inch thick, minimum.
    3. Stainless Steel: ASTM A240/A240M,Type 304, 14 gauge (0.0781 inch) thick, minimum.
    4. Column Section Length: 12 feet, maximum, between horizontal joints.
    5. Joint Type: Butt.
    6. Horizontal Reveals: Top, bottom, and center.
    7. Fasteners: Self-drilling; manufacturer's standard stainless steel or cadmium-plated.
    8. Aluminum Finish: Manufacturer's standard, factory applied PVDF coating.
    9. Stainless Steel Finish: Manufacturer's standard #4.
    10. Color: To be selected by Architect from manufacturer's standard range.
    11. Color: _____.
    12. Manufacturers:
        a. DAMS Incorporated; CPSS Series: www.damsinc.com/#sle.
        b. Metalwerks; ____: www.metalwerksusa.com/#sle.
        c. SAF Metal Fabrication, a division of Southern Aluminum Finishing Company, Inc; ____: www.saf.com/#sle.
        d. _____.
        e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Factory Fabricated Column Covers: Factory fabricated and factory finished, MCM column covers, mechanically fastened to structural support.
    1. Material: Manufacturer's standard MCM sheet.
    2. MCM Sheet Thickness: 0.24 inch core.
    3. Column Section Length: 12 feet, maximum, between horizontal joints.
    4. Joint Type: Butt.

5. Horizontal Reveals: Top, bottom, and center.
6. Fasteners: Self-drilling; ASTM A449 heat treated steel, with manufacturer's standard corrosion resistant coating.
7. Aluminum Finish: Manufacturer's standard factory applied PVDF coating.
8. Color: To be selected by Architect from manufacturer's standard range.
9. Color: _____.
10. Manufacturers:
    a. DAMS Incorporated; CCCC Series: www.damsinc.com/#sle.
    b. _____.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Aluminum Sheet: ASTM B209/B209M, 5005-H32 minimum; alloy and temper recommended by aluminum producer and finisher for use and finish indicated.

D. Galvanized Steel Sheet: ASTM A653/A653M, G90 (Z275) coating.

E. Steel Sheet: ASTM A1008/A1008M uncoated, cold rolled, Type CS (commercial steel), exposed or ASTM A879/A879M electrolytic zinc coating over ASTM A1008/A1008M steel sheet substrate.

F. Stainless Steel Sheet: ASTM A240/A240M.

G. Stainless Steel Sheet: ASTM A666, Type 304; stretcher-leveled.

H. Bronze Sheet: ASTM B36/B36M, UNS No. C28000 (muntz metal, 60 percent copper).

I. Brass Sheet: ASTM B36/B36M, UNS No. C26000 (cartridge brass, 70 percent copper).

J. Copper Sheet: ASTM B370, H00 temper; cold-rolled copper sheet.

K. Titanium Sheet: ASTM B265, Grade 1.

L. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials; core material free of voids and spaces; no foamed insulation material content.
    1. Overall Sheet Thickness: 4 mm.
    2. Face Sheet Thickness: 0.19 inches, minimum.
    3. Alloy: Manufacturer's standard, selected for best appearance and finish durability.
    4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.
    5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    6. Flammability: Self-ignition temperature of 650 degrees F or greater, when tested in accordance with ASTM D1929.
    7. Factory Finish: One coat fluoropolymer resin coating, approved by the coating manufacturer for the length of warranty specified for the project, and applied by coil manufacturing facility that specializes in coil applied finishes.
        a. Basis of Design: _____ fluoropolymer resin coating as manufactured by _____.
        b. Coating Flexibility: Pass ASTM D4145 minimum 1T-bend, at time of manufacturing.
        c. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.
    8. Finish: Factory finished highly polished Class I natural anodized finish; AAMA 611 AA-M12C22A41, anodic coating not less than 0.7 mils thick.

9. Finish: _____.
10. Color/Texture: As indicated on drawings.
11. Color/Texture: As selected Architect from manufacturer's standard selection.
12. Color/Texture: Custom color to match Architect's sample; manufacturer's standard texture.
13. Color: _____.

M. Metal Framing Members - MCM Panels: Include all sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.
1. Provide material strength, dimensions, configuration as required to meet the applied loads applied and in compliance with applicable building code.
2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60; or ASTM A792/A792M aluminum-zinc coated to AZ60.
3. Stainless Steel Sheet Components: ASTM A480/A480M.
4. Aluminum Components: ASTM B209/B209M or ASTM B221.

N. Anchors, Clips and Accessories: Use one of the following:
1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
2. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A153/A153M.
3. Steel complying with ASTM A36/A36M and hot-dipped galvanized to ASTM A123/A123M Coating Grade 35.
4. Interior Locations: Carbon steel; zinc coated in accordance with ASTM B633 or ASTM F1941/F1941M Class Fe/Zn 5.
5. Exterior Locations or in Contact with Stainless Steel:
   a. Bolts: Stainless steel; ASTM F593, Group 1 (A1).
   b. Nuts: Stainless steel; ASTM F594.
6. Structural Anchors: Provide anchors where work is indicated to comply with design loads.
   a. Type: Provide chemical or torque-controlled expansion anchors.
   b. Capacity: When tested according to ASTM E488/E488M; four times the load imposed when installed in concrete.
7. Nonstructural Anchors: Provide powder-actuated fasteners where work is not indicated to comply with design loads. Provide size and number required for load, installation, and as recommended by manufacturer, unless indicated otherwise.

O. Fasteners, General: Same basic metal and alloy as formed metal sheet unless indicated otherwise. Do not use metals incompatible with the materials joined.

P. Fasteners, MCM Panels:
1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
2. Screws: Self-drilling or self-tapping ASTM A276/A276M, Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
3. Bolts: Stainless steel.

Q. Gaskets: As required to seal joints in decorative formed metal and remain airtight; as recommended in writing by decorative formed metal manufacturer.
1. ASTM D1056, Type 1, Class A, grade as recommended by gasket manufacturer to obtain seal for application indicated.
2. Closed-cell polyurethane foam, adhesive on two sides, release paper protected.

R. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.

S. Joint Sealer, Exterior: ASTM C920; elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in decorative formed metal and remain weathertight; and as recommended in writing by decorative formed metal manufacturer.

T. Joint Sealer, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C834; of type and grade required to seal joints in decorative formed metal; as recommended in

writing by decorative formed metal manufacturer and with a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

U. Joint Sealer: Clear silicone sealant approved by MCM sheet manufacturer.

V. Sound Deadening Materials:
   1. Insulation: Unfaced, mineral-fiber blanket insulation; ASTM C665, Type I, and passing ASTM E136 test.
   2. Mastic: ASTM D1187/D1187M; cold-applied asphalt emulsion.

W. Laminating Adhesive: Recommended by metal fabricator; fully bond metal to metal, prevent telegraphing and oil canning; compatible with substrate; noncombustible after curing. VOC contents calculated according to 40 CFR 59, Subpart D (EPA Method 24) listed below.
   1. Contact Adhesive: 80 g/L or less.
   2. Metal-to-Metal Adhesive: 30 g/L or less..
   3. Multipurpose Construction Adhesive: 70 g/L or less.
   4. Special-Purpose Contact Adhesive: 250 g/L. Use for to bond melamine-covered board, metal, unsupported vinyl, ultrahigh molecular weight polyethylene, and rubber or wood veneer, 1/16 inch thick or less, to any surface.
   5. Adhesive shall comply with the testing and product requirements of CAL (CDPH SM).

X. Isolation Coating: Manufacturer's standard alkali-resistant coating.

2.07 PAINTS AND COATINGS

A. As specified in Section 09 91 23.

B. Galvanizing Repair Paint: High-zinc-dust-content paint; comply with SSPC-Paint 20, compatible with other coatings specified for galvanized metal.

C. Lacquer for Copper Alloys: Clear, acrylic lacquer specially developed for coating copper-alloy.

D. Universal Shop Primer for Ferrous Metal: Fast curing, lead and chromate free, universal modified alkyd primer; containing pigments easily distinguishable from color of zinc-rich primer.

E. Epoxy Zinc-Rich Primer: Compatible with top coat.

F. Shop Primer for Galvanized Steel: Cementitious galvanized metal primer.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.08 FINISHES

A. Finishes, General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.

B. Aluminum Finishes:
   1. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
   2. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.
   3. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
   4. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick.
   5. Class II Color Anodized Finish: AAMA 611 AA-M12C22A32 Integrally colored anodic coating not less than 0.4 mils thick.
   6. Class II Color Anodized Finish: AAMA 611 AA-M12C22A34 Electrolytically deposited colored anodic coating not less than 0.4 mils thick.

7. Natural Anodized Finish with Organic Seal: AAMA 612 Clear anodic coating with non-aqueous electro-deposited organic seal; not less 0.7 mils thick.
8. Color Anodized Finish with Organic Seal: AAMA 612 Electrolytically deposited colored anodic coating with non-aqueous electro-deposited organic seal; not less 0.7 mils.
9. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
10. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
11. Pigmented Organic Coatings: AAMA 2603; polyester or acrylic baked enamel finish.
12. Siliconized Polyester Finish: Silicone modified, polyester enamel topcoat over epoxy primer; coating not less than 1 mil thick.
13. Aluminum Finish: _____.
14. Color: As indicated on drawings.
15. Color: To be selected by Architect from manufacturer's standard range.
16. Touch-Up Materials: As recommended by coating manufacturer for field application.

C. Galvanized Steel Finishes:
1. Repair Galvanized Surfaces: Clean welds and abraded areas and repair galvanizing to comply with ASTM A780/A780M.
2. Factory Prime: Apply shop primer to prepared surfaces of items where field painting after installation indicated, unless indicated otherwise. Comply with requirements in SSPC-PA 1.
3. Baked-Enamel Finish: Manufacturer's standard two-coat baked-enamel finish; topcoat minimum dry film thickness of 1.0 mil. Total minimum dry film thickness; 2.0 mils.
4. Powder-Coat Finish: Manufacturer's standard thermosetting polyester or acrylic urethane powder coating; minimum cured-film thickness of 1.5 mils.
5. Siliconized Polyester Finish: Silicone modified, polyester enamel topcoat over epoxy primer; coating not less than 1.0 mil thick.
6. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
7. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.

D. Steel Finishes:
1. Surface Preparation: Comply with SSPC-SP 1; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust from uncoated steel; comply with SSPC-SP 5.
2. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating applied over it.
3. Factory Prime: Apply shop primer to prepared surfaces of items where field painting after installation indicated, unless indicated otherwise..
4. Baked-Enamel Finish: Manufacturer's standard two-coat baked-enamel finish; topcoat minimum dry film thickness of 1.0 mil. Total minimum dry film thickness: 2.0 mils.
5. Powder-Coat Finish: Manufacturer's standard thermosetting polyester or acrylic urethane powder coating; minimum cured-film thickness of 1.5 mils.

E. Stainless Steel Finishes:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Comply with NAAMM AMP 500-06; grind and polish surfaces to uniform finish free of cross scratches. Run grain of directional finishes with long dimension of each item.
    a. Bright, Cold-Rolled, Unpolished: No. 2B
    b. Directional Satin: No. 4.
    c. Dull Satin: No. 6.
    d. Satin, Reflective, Directional Polish: No. 7.
    e. Mirrorlike Reflective, Nondirectional Polish: No. 8.

3. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

F. Copper Alloy Finishes: NAAMM AMP 500-06.
1. Buffed Finish: M21; buffed, smooth specular.
2. Hand Rubbed Finish: M31-M34; directionally textured, fine satin, hand rubbed.
3. Medium Satin Finish: M32; directionally textured, medium satin.
4. Fine Matte Finish: M42; nondirectional finish, fine matte.
5. Buffed Finish, Lacquered: M21-O6x; buffed, smooth specular with minimum 1.0 mil thick clear organic coating.
6. Hand Rubbed Finish, Lacquered: M31-M34-O6x; directionally textured, fine satin, hand rubbed with minimum 1.0 mil thick clear organic coating.
7. Medium Satin Finish, Lacquered: M32-O6x; directionally textured, medium satin with minimum 1.0 mil thick clear organic coating.
8. Fine Matte Finish, Lacquered: M42-O6x; nondirectional finish, fine matte with minimum 1.0 mil thick clear organic coating.
9. Statuary Conversion Coating over Satin Finish: M31-C55: directionally textured, fine satin with sulfide conversion coating; color to match sample selected by Architect.
10. Statuary Conversion Coating over Satin Finish, Lacquered: M31-C55-O6x; directionally textured, fine satin with sulfide conversion coating and minimum 1.0 mil thick clear organic, coating; color to match sample selected by Architect.

G. Titanium Finishes:
1. Dull Matte Finish: Pickled and annealed.
2. Bright Matte Finish: Vacuum annealed.
3. Protect finish as needed during fabrication by applying a strippable, temporary protective covering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

B. Deliver anchorage items to be cast into concrete or built into masonry to appropriate installer(s) together with setting templates.

C. Coat concrete and masonry surfaces that will be in contact with metal surfaces with bituminous coating.

3.03 INSTALLATION - SHEET METAL AND PLATE FABRICATIONS

A. Locate and place decorative formed sheet metal items level and plumb; align with adjacent construction. Cut, drill and fit as required to install.

B. Do not cut or abrade sheet metal finishes that cannot be completely restored in the field. Return such items to manufacturer or fabricator for required alterations and refinishing or provide new items.

C. Use concealed anchorages where possible. Provide washers where needed on bolts or screws to protect metal surfaces and make weathertight connection.

D. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers indicated.

E. Install gaskets, joint fillers, insulation, sealants, and flashings as work progresses.
   1. Make exterior decorative formed sheet metal items weatherproof.
   2. Make interior decorative formed metal items soundproof or lightproof as required.

F. Corrosion Protection: Apply permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with incompatible substrate materials. Prevent corrosion damage to material and finish.

3.04 INSTALLATION - MCM FABRICATIONS

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and fabricator, and with approved shop drawings.

C. Install securely allowing for necessary thermal and structural movement; comply with fabricator's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by fabricator and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Where joints are designed for field applied sealant, seal joints completely with specified sealant.

H. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
   1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
   2. Deviation of Vertical Member From True Line: 1/8 inch in 25 feet run, maximum.
   3. Deviation of Horizontal Member From True Line: 1/8 inch in 25 feet run, maximum.
   4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 1/32 inch, maximum.

I. Replace damaged products.
   1. Exception: Field repairs of minor damage to finishes are permitted.
   2. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.
   3. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under typical light conditions experienced at project.

3.05 CLEANING

A. Clean copper alloys according to metal finisher's written instructions. Provide undamaged and uniform finish matching approved sample.

B. Shop Primer Touch-up and Repair: Clean field welds, bolted connections, and abraded areas of shop paint.
   1. Paint exposed areas with same material used for shop painting.
   2. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.

C. Restore finishes damaged during installation and construction period. Return items that cannot be refinished in the field to manufacturer or fabricator. Refinish entire unit or provide new units.

D. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

E. Remove temporary coverings and protection of adjacent work areas.

F. Clean installed products in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Protect installed products from damage during construction.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Framing with dimension lumber.
   2. Shear wall panels.
   3. Rooftop equipment bases and support curbs.
   4. Wood blocking, cants, and nailers.
   5. Wood furring.
   6. Wood sleepers.
   7. Plywood backing panels.

1.02 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent or less, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an approved inspection agency.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: As indicated on drawings.

B. Framing Other Than Non-Load-Bearing Interior Partitions: As indicated on drawings.

C. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
   1. Application: Exposed exterior and interior framing.
   2. Species and Grade: As indicated above for load-bearing construction of same type.

2.04 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.

B. For items of dimension lumber size, provide No. 1 and Better grade lumber of any species.

2.05 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 1.

2.06 WALL SHEATHING

A. Plywood Wall Sheathing: Exposure 1, Structural I sheathing.

2.07 ROOF SHEATHING

A. Plywood Roofl Sheathing: Exposure 1, Structural I sheathing.

2.08 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.
   1. Plywood 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."

2.09 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M, or stainless steel fasteners.

B. Power-Driven Fasteners: ICC ESR-1482.

C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.10 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Simpson Strong-Tie Co., Inc.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Product values are to be published in an ICC ESR Report.

D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
   1. Use for interior locations unless otherwise indicated.

2.11 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with 2013 CBC Chapter 23 and AF&PA's WCD 1, "Details for Conventional Wood Frame Construction,"

C. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole unless noted otherwise on drawings.

E. Do not splice structural members between supports unless otherwise indicated.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

H. Install joists, beams and rafters with crown up, unless directed otherwise by manufacturer.

3.02 PANEL INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated.

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements. Provide 1/8” gap between abutting panels.

3.03 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated on plans:

3.04 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items, other than shop prefabricated casework.

B. Hardware and attachment accessories.

1.02 RELATED SECTIONS

A. Section 05 40 00 - Cold-Formed Metal Framing: Support framing.

B. Section 09 90 00 - Painting and Coatings

1.03 REFERENCES

A. ANSI A135.4 - Basic Hardboard.

B. HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.

C. NHLA - National Hardwood Lumber Association - Rules for Measurement and Inspection of Hardwood and Cypress Lumber.

D. PS 1 - National Bureau of Standards - Construction and Industrial Plywood.

E. PS 20 - American Softwood Lumber Standard.

F. T24, CCR - Title 24, California Code of Regulations.

G. WI - Woodwork Institute - Architectural Woodwork Standards, 1st edition.

H. 2013 California Green Building Standards Code

1.04 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - Submittal Proceedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories at a minimum scale of 1-1/2 inch to 1 ft.; Shop Drawings shall bear the WIC Certified Compliance Label.

C. Provide instructions for attachment hardware, and finish hardware.

D. Submit two samples of wood trim 12 inches long, for each profile.

E. Millwork Certification: Submit WI Certified Compliance Certificate from millwork supplier, indicating that all requirements of WI specifications have been met.

F. Installer’s Certification: Submit WI Certified Compliance Certificate from the millwork installer, upon completion of the installation.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with references.

B. All millwork shall be fabricated to requirements of WI Custom quality.

C. Provide certifications from WI for woodwork and installation.

D. All materials shall be protected from rain and other sources of moisture by appropriate in-transit and on-site procedures. Porous materials with visible microbial growth shall not be used. Non-porous materials with visible microbial growth damage shall not be used. Non-porous materials with visible microbial growth but without damage (as determined by the Architect) shall be decontaminated.

1.06 QUALIFICATIONS

A. Fabricator: Company specializing in fabricating the materials specified in this section with minimum five years documented experience.

B. Installer: Company specializing in installation of materials specified in this section with minimum five years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to T24, CCR for fire retardant requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage, and from extreme changes in temperature or humidity.

B. Interior millwork and finish carpentry shall not be permitted in building until plaster, grout, or other water-holding materials are reasonably dry.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01 03 90.

B. Coordinate the work with grounds and backing provided under other sections, and with the installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Softwood Lumber: PS 20; Graded in accordance with WIC Custom classification; Douglas Fir species unless otherwise indicated; maximum moisture content of 6 percent, with well-matched color and grain suitable for transparent finish.

B. Hardwood Lumber: NHLA; Graded in accordance with WIC Custom classification; Birch or maple species unless otherwise indicated (Do not mix); maximum moisture content of 6 percent, with well-matched color and grain suitable for transparent finish.

C. Exterior Trim and Boards: Clear heart redwood, unless otherwise indicated.

2.02 SHEET MATERIALS

A. Softwood Plywood: PS 1 Grade A; APA stamped; Graded in accordance with WIC Custom classification; lumber core; Douglas Fir face species, unless otherwise indicated.

B. Hardwood Plywood: HPMA Grade A; Graded in accordance with WIC Custom classification; MDF core; Birch or maple species unless otherwise indicated (Do not mix).

C. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, tempered grade, thickness as indicated, minimum ¼ inch; smooth two sides.

D. Finish Plywood Wall and Wainscot: Douglas Fir Plywood; Interior Type, Grade A-C: A-Face exposed, 3/8” thick.
   1. Edge: Stainless Steel Channel top edge cap, free of sharp edges.

2.03 FASTENERS

A. Fasteners: Of size and type to suit application; galvanized finish in concealed locations and cadmium finish in exposed locations.

B. Concealed Joint Fasteners: Threaded steel.

2.04 ACCESSORIES

A. Lumber for Shimming and Blocking: Douglas Fir, Grade C and better.

B. Wood Filler: Oil base; tinted to match surface finish.

2.05 FABRICATION

A. Fabricate to WI Custom standards.

B. Shop assemble work for delivery to site, permitting passage through largest available building openings.

C. Fit exposed sheet material edges with matching veneer edging. Use one piece for full length only.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Wherever practicable, means of fastening various parts together shall be concealed.

F. Curved work shall be made from solid stock; except veneers, which shall be bent over suitable drums as recommended by manufacturer.

2.06 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes on hardwood, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with Section 09 90 00.

E. Prime paint surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify finished surfaces, mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. Verify sealant or calking between materials to be covered by trim is in place, set, and ready to be covered. Do not set trim over sealant prior to set, unless otherwise instructed.

3.02 INSTALLATION: PLYWOOD WAINSCOT

A. Fasten to studs over gypsum board, face grain vertical.

B. Panel width 4’-0” where practicable, V-joints.

C. Vertical joints occur only over studs, horizontal joints not permitted.

D. Install trim, butt joints tight for smooth edges free of protrusions or any sharp conditions.

3.03 INSTALLATION: OTHER FINISH CARPENTRY

A. Install work in accordance with WIC Custom Quality standards.

B. Set and secure materials and components in place, plumb, level, and true to line.

C. C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install trim with screws at 12 inch on center.

E. Use full length pieces of trim, without splicing, except where use of single piece of trim is impossible. Butt joints, if necessary, shall be beveled.

F. All exterior angles shall be miter cut, and interior of molded pieces shall be coped. Seams over 1/32 inch will be rejected.

G. Where work of this section adjoins dissimilar materials, make a neat, tight joint.

H. Finish carpentry showing hammer marks or similar damage of any kind will be rejected.

3.04 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners below finished surfaces. Apply wood filler in exposed fastener indentations.

B. Sand finished work smooth to leave work free of tool marks, sandpaper marks, and any other defacing marks created by fabrication or installation processes.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

D. Apply finishes on all exposed surfaces of trim, prior to installation of transparent sealant or calking.

3.05 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated Compact Plastic Laminated and High Pressure Plastic Laminated millwork units.

B. Countertops.

C. Hardware.

D. Preparation for installing utilities.

1.02 REFERENCE STANDARDS

A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.

B. BHMA A156.9 - Cabinet Hardware 2020.

C. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

D. UL (DIR) - Online Certifications Directory Current Edition.

E. WI (CCP) - Certified Compliance Program (CCP) Current Edition.

F. WI (CSIP) - Certified Seismic Installation Program (CSIP) Current Edition.

G. WI (MCP) - Monitored Compliance Program (MCP) Current Edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.04 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1 inch to 1 foot, minimum.
   2. Provide the information required by Woodwork Institute (WI).
   3. Include certification program label.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
   3. Single Source Responsibility: Provide and install this work from single fabricator.

B. Quality Certification:
   1. Comply with WI (CCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: https://woodworkinstitute.com.

2. Provide labels or certificates indicating that the installed work complies with WI requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.WI
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
6. Replace, repair, or rework all work for which certification is refused.

1.06 ACCESSIBLE CASEWORK

A. Operable parts for all accessible casework shall comply with CBC Section 11B-309 for clear floor space, height, and operation requirements.

1.07 MOCK-UPS

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

B. Locate where directed.

C. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

B. Buildings should be climatized (HVAC working) before installation of casework.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by WI Architectural Woodwork Standards for Custom Grade or better.

B. Cabinets:
1. Finish - Exposed Exterior Surfaces: High Pressure Plastic Laminate (HPPL) as scheduled on drawings.
2. Finish - Exposed Interior Surfaces: HPPL as scheduled on drawings.
3. Finish - Interior Concealed Surfaces: Melamine.
4. Door and Drawer Front Edge Profiles: 1mm edge band.
5. Door and Drawer Front Retention Profiles: Fixed panel.
6. Casework Construction Type: Type A - Frameless.
7. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
8. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
    a. Custom Grade: Doors, drawer fronts and false fronts with wood grain design to run and match vertically within each cabinet unit unless noted otherwise.
9. Adjustable Shelf Loading: 40 psf.
    a. Deflection: L/144.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Use minimum 3/4" plywood for cabinet construction, including shelving cores.

C. Drawer bottoms to be 1/4" plywood with white melamine finish.

2.03 LAMINATE MATERIALS

A. Manufacturers:
1. As listed on drawing Finish Schedule
2. Substitutions: see Section 01 63 00 - Product Substitution Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as indicated.
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, finish as indicated.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, finish as indicated.
   3. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, through color, colors as indicated, finish as indicated.
   4. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, through color, colors as indicated, finish as indicated.
   5. Drawer and Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, white color, smooth finish..

2.04 COUNTERTOPS

A. Countertops are specified in Section 12 36 00 - Countertops.

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Glass: Clear 1/4-inch tempered.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Grommets: Standard plastic grommets for cut-outs, in standard colors to be selected by architect..

2.06 HARDWARE

A. Hardware: BHMA A156.9, types as scheduled or, if not indicated, provide per WI standards for Custom Grade.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.

C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers ("U" shaped wire pull steel with chrome finish, 100 mm centers). ADA Compliant per CBC Section 1125B.4..
   1. Prvovide U shaped wire pulls or equally accessible pull hardware at all accessible casework. CBC Section 1125B.4.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
   1. All casework shall lock, Each room shall be keyed alike with one master key for all casework.

E. Hinges: Heavy Duty 5-knuckle institutional type, mill ground with hospiltal tips, 270 degree. Rockford Process RPS 376 http://www.rockfordprocess.com/ or equal

F. Sliding Door Track Assemblies: Upper and lower track of satin anodized aluminum, with matching shoe equipped with nylon rollers.

2.07 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL (DIR) listed and approved identification on fire retardant treated material.

2.08 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline with manufacturers color match caulking at butt joints; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
   1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor per drawings.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 14 00
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, and joint and crack sealants.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 FLUID-APPLIED WATERPROOFING MATERIALS

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mineral wool insulation

1.02 REFERENCE STANDARDS

A. ASTM E 2307 - Perimeter Fire Containment Tests

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).

D. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies 2018.

1.03 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and Compliance with ASTM 2307.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Mineral wool insulation for the following appllications:
   1. Thermal and acoustical exterior wall insulation.
   2. Perimeter fire containment systems.
   3. Thermal and acoustical insulation at curtain wall spandrel.

2.02 MINERAL FIBER BOARD INSULATION MATERIALS

A. Mineral Wool Insulation: in accordance with ASTM C612.
   1. Formaldehyde-Free
   2. Facing: Unfaced.
   3. Density: 8.0 pcf (nominal).
   4. Surface Burning Characteristics: Tested in accordance with ASTM E84
      a. Unfaced: Flame Spread 0 and Smoke Developed 0
   5. Corrosivity: Non-corrosive, when tested in accordance with ASTM C665.
   6. UL Certified Environmental Product Declaration in accordance with ISO 14025.
   7. Board Thickness: 5 inch.(Minimum R value: R19)

B. Products:
   1. Owens Corning Corporation; Thermafiber FireSpan FF 90: www.ocbuildingspec.com.
   2. Substitutions: See section 01 63 00 Product Substitution Proceedures

2.03 PERIMETER FIRE CONTAINMENT SYSTEMS

A. General: Provide where indicated for gaps between the perimeter edge of the fire-resistance-rated floor assemblies and non-fire-resistance-rated exterior curtain walls and metal stud wall assemblies.
   1. Provide a perimeter fire-containment system with the fire test response characteristics indicated, as determined by testing identical systems per the Underwriters Laboratories or Intertek (OPL) Laboratories, or another testing and inspecting agency accountable to authorities having jurisdiction.

2. If no tested system exists, an engineering judgment provided by the manufacturer, 3rd party testing lab, or fire protection engineering firm that follows guidelines established by the International Firestop Council must accompany the design.
3. Division of State Architect (DSA) will have the final review and approval for proposed product substitutions to the DSA approved project documents.

B. UL assemblies as indicated on drawings are basis of design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install systems in accordance with Underwriters Laboratories and manufacturer's instructions.
1. Install products in proper relationship with each other and adjacent construction.
2. Install to prevent the bowing of the curtain wall insulation due to the compression fit.
3. Fasten insulation in place with mechanical fasteners within the mullions (spandrel area), spaced at intervals recommended by listed and tested assembly to hold insulation securely in place without touching the exterior wall. One inch air space must be maintained.

3.03 PROTECTION

A. Protect installed products from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 27 26
GYPSUM AIR AND VAPOR BARRIER SHEATHING SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Combination of wall sheathing with factory fluid-applied, vapor-permeable, air and water resistive membrane.

1.02 RELATED SECTIONS

A. Section 04 30 16 - Adheared Masonry Veneer System

B. Section 05 40 00 - Cold-formed Metal Framing

C. Section 07 42 43 - Aluminum Composite Material (AMC) Wall Panel System

D. Section 09 24 00 - Portland Cement Plaster

1.03 DEFINITIONS

A. Air and Water Barrier Accessory: A transitional component of the air and water barrier that provides continuity.

B. Air and Water Barrier Assembly: The collection of air and water barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air and water movement through the wall.

C. Factory Fluid-Applied Air and Water Barrier Panel: A glass mat-faced, moisture and mold-resistant gypsum panel. The panel features a non-combustible core integrated with a factory fluid-applied permeable air and water barrier membrane applied to the exterior/exposed side of the panel.

D. Fluid-Applied Air and Water Barrier Material: A uniform factory fluid-applied primary element that provides a continuous barrier to the movement of air and water.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate installation of factory fluid-applied air and water barrier panel with framing installation and subsequent operations that impact finished envelope air-barrier work.

B. Preinstallation Conference: Conduct conference at project site.
   1. Review factory fluid-applied air and water barrier panel and accessory materials installation including:
      a. Joints between factory fluid-applied air and water barrier panels and material transitions to abutting construction.
      b. Requirements for forming and sealing penetrations of air barrier by other trades.
      c. Installation sequence of factory fluid-applied air and water barrier panels.
      d. Project and manufacturer's details.
      e. Mockups, testing, and inspection intervals report requirements.
      f. Coordination and sequencing of air barrier work with work of other Sections.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of factory fluid-applied air and water barrier assembly. Indicate component materials and dimensions and include construction and application details including:
   1. Framing preparation instructions and recommendations.
   2. Membrane, transitions, sealants, and accessories.
   3. Preparation and treatment requirements for transition substrates, and compatibility information.
   4. Test data on air and moisture infiltration.
   5. Include standard drawings illustrating manufacturer's written installation and finishing instructions applicable to Project, including details for joints, counter flashings,

penetrations, terminations, and tie-ins to adjacent construction.
   a. Illustrate interfaces with other work that forms part of air barrier to demonstrate continuity.
   b. Where standard drawings do not address Project conditions, provide Shop Drawings prepared for Project to illustrate proposed construction.

B. Shop Drawings: Include coordinated construction detail drawings including:
   1. Fabrication and installation layouts of coordinated exterior wall assemblies where factory fluid-applied air and water barrier panels are used.
   2. Details illustrating inside corners, outside corners, joints, head-of-wall, base of wall, counter-flashings, penetrations, terminations, control and expansion joints and tie-ins to adjacent construction.
   3. Illustrate interfaces with other work that forms part of air barrier to demonstrate continuity.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: Installer shall be trained and approved by the manufacturer for the complete installation of the specified system.

B. Manufacturer Product Certificates: Indicate compliance with requirements of specified products under section 2.2 - Performance Requirements. Article

C. Product Test Reports: Test data for factory fluid-applied air and water barrier panel assembly, by qualified testing agency, indicating proposed factory fluid-applied air and water barrier assembly meets performance requirements.

D. Warranty: Sample of unexecuted manufacturer warranty.

E. Field quality control reports.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified factory fluid-applied air and water barrier panel assembly manufacturer experienced in manufacture of factory fluid-applied air and water barrier panel assembly as one of its principal products.

B. Installer Qualifications: An experienced Installer approved by factory fluid-applied air and water barrier panel assembly manufacturer and employing applicators trained in application of specified products.

C. Testing Agency Qualifications: Qualified independent agency experienced in the installation of the specified air and water barrier system, and qualified to perform observation and inspection specified in section 3.5 - Field Quality Control to determine Installer’s compliance with the requirements of this Project. Testing agency to be acceptable to Architect and retained by the contractor.

D. Mockups: Provide factory fluid-applied air and water barrier panel assembly mockup application in an area of not less than 150 sq. ft. (14 sq. m) of wall surface where directed by Architect for each type of backup wall construction. Include examples of surface preparation, crack and joint treatment, air barrier application, and flashing, transition, and termination conditions, and to set quality standards for execution.
   1. Include factory fluid-applied air and water barrier system tie-in details between walls and roof, and with wall and foundation wall. Include penetrations and openings.
   2. Approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packaging and store in an enclosed shelter providing protection from damage and exposure to the elements.
   1. Store within temperature limits required by manufacturer.
   2. Store factory fluid-applied air and water barrier panels flat.
   3. Comply with manufacturer’s requirements for safety and handling.

B. Discard liquid sealants and adhesives that cannot be applied within their stated shelf life.

C. Store accessory materials in a location with constant ambient temperatures of 50 to 80 deg F (15 to 27 deg C).

1.09 FIELD CONDITIONS

A. Cold Weather Conditions:
   1. Factory Fluid-Applied Air and Water Barrier Panel: Comply with manufacturer's cold weather application instructions when atmospheric temperatures or substrate surface temperatures are less than 40 deg F (4 deg C).
   2. Accessories and Sealants: Comply with manufacturer’s cold weather application instructions when atmospheric temperatures or substrate surface temperatures are less than 40 deg F (4 deg C).
   3. Do not apply factory fluid-applied air and water barrier accessories to a damp or wet substrate or during snow, rain, fog, or mist.

B. Exposure: Comply with manufacturer’s limitations on exposure of applied product.
   1. Protect adjacent substrates from environmental conditions that affect air barrier performance.

C. Coordinate installation of factory fluid-applied air and water barrier panel assembly with completion of roofing, below grade, factory fluid-applied membrane portion to site fluid-applied membrane portion and other work requiring interface with air barrier.

D. Schedule work for observation of factory fluid-applied air and water barrier panel assembly applications prior to concealment.

E. Ensure factory fluid-applied air and water barrier panel accessories are cured before covering with other materials.

1.10 WARRANTY

A. Manufacturer's Warranty for Factory Fluid-Applied Air and Water Panel Products: Manufacturer’s standard form in which manufacturer agrees to replace each nonconforming product shown to be nonconforming. Warranty period start is from the date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Bases-of-Design:
   1. Manufacturer: USG-TREMCO
   2. Product: Securock ExoAir 430 Panel System

B. Substitutions: See Section 01 60 00 - Product Requirements.
   1. Requests for substitutions will be considered in accordance with the provisions of Section 01 63 00 - Product Substitution Procedures.

2.02 MATERIALS

A. Source Limitations: Obtain primary air barrier materials and air barrier accessories from single source.

2.03 PERFORMANCE REQUIREMENTS

A. Air and Water Barrier Performance: Factory fluid-applied air and water barrier panel assembly and seals to adjacent construction shall be capable of performing as a continuous air barrier system and as a water-resistive barrier flashed to direct incidental water to wall exterior, and interface with adjacent building air barrier system components.
   1. Factory fluid-applied air and water barrier panel assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Factory Fluid-Applied Air and Water Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

C. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
   1. No evidence of water penetration through factory fluid-applied air and water barrier assembly when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sqft (300 Pa) and no evidence of water penetration for 2 hours.

D. Nail Sealability of the panel requirement: validate the panel (membrane and exterior sheathing board composite - not including the detailing sealant) according to ASTM D1970 Section 7.9 Nail Sealability modifying nail for façade anchoring mechanism.

E. Fluid applied air barrier membrane requirement: minimum 200% Elongation according to ASTM D412

F. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

G. Surface-Burning Characteristics: Tested in accordance with ASTM E 84 test method; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.
   3. Securock ExoAir 430 Factory Fluid-Applied Air and Water Barrier Panels
      a. Flame-Spread Index: 20
      b. Smoke Developed Index: 15

H. Fire Propagation Characteristics: Provide factory fluid-applied air and water barrier panel assembly qualified as a component of a comparable wall assembly that has been tested and passed NFPA 285.

2.04 FACTORY FLUID-APPLIED AIR AND WATER BARRIER PANELS

A. Air and Water Resistive Sheathing Panel with Factory Fluid-Applied Membrane: ASTM C 1177/C 1177M, glass-mat-faced gypsum sheathing board with an elastomeric, UV-resistant synthetic polymer membrane.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation and Tremco Incorporated; Securock® ExoAir® 430 Panel.
   2. Panel Thickness: 5/8 inch (15.9 mm) thick.
   3. Panel Type: Type X.
   4. Panel Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.
   5. Air and Water Resistive Coating Thickness: Minimum 20 mils (0.5 mm) dry-film thickness (DFT).
   6. Physical and Performance Properties:
      a. Air Permeance; ASTM E 2178: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75 Pa) pressure difference.
      b. Water Vapor Permeance; ASTM E 96/E 96M, Method B: Class III, vapor permeable; between 1.0 and 10 perms (57.5 and 690 ng/Pa x s x sq. m).
      c. Combustion Characteristics; ASTM E 84: Class A.
      d. Panel Product Antifungal Properties; ASTM D 3273: 10; 0 defacement.
      e. VOC Content: 50 g/L or less.
      f. Ultraviolet and Weathering Resistance: Maximum 12-month exposure.
      g. Membrane Color: Light Orange.

2.05 AIR-BARRIER ACCESSORY MATERIALS

A. General: Provide compatible air-barrier accessory materials furnished or recommended by factory fluid-applied air and water barrier panel manufacturer as required by Project conditions to produce a complete air-barrier assembly identical to tested assemblies meeting performance requirements.

B. Primer: Liquid primer recommended by air-barrier manufacturer for substrates requiring field application of air-barrier materials.

1. Basis-of-Design Product: Tremco, Inc., ExoAir® Primer

C. Fluid-Applied Air-Barrier Membrane: Site-applied synthetic polymer membrane for application to adjacent substrates, detailing, and repairs.
   1. Basis-of-Design Product: Tremco, Inc., ExoAir® 230.
   2. Volatile Organic Compound (VOC) Content: 35 g/L or less.
   3. Volatile Organic Emissions (VOE): GREENGUARD certified, it has met the world's most difficult and complete standards for low emissions of VOC's into indoor air.
   4. Adheres to California Department of Public Health (CDPH) Standard Method V1.1-2010.
   5. Color: Light Orange.

D. High- and Low-Temperature Flashing and Transition Strip: Self-adhering strip 22 mils (0.61 mm) thick, consisting of butyl laminated to an aluminized facer with a release liner.
   1. Basis-of-Design Product: Tremco, Inc., [ExoAir® 111] [ExoAir® 110AT].

E. Wall Opening Transition Assembly: Cured low-modulus extruded silicone sheet, with reinforcing ribs, sized to fit opening widths, with aluminum race configured for insertion into aluminum framing extrusions, compatible with specified silicone joint sealant and fluid-applied membrane air-barrier.
   1. Basis-of-Design Product: Tremco, Inc., Proglaze ETA Engineered Transition Assembly.

F. Wall Opening Transition Sheet: Cured low-modulus extruded silicone sheet, compatible with specified silicone sealant and fluid-applied membrane air-barrier.
   1. Basis-of-Design Product: Tremco, Inc., Proglaze ETA Connections Single-Ribbed Sheet.

G. Reinforcing Mesh: Self-adhering fiberglass mesh, not less than 6 inches (152 mm) wide.
   1. Basis-of-Design Product: Securock® ExoAir® Reinforcing Mesh.

H. Joint Sealant for Exposed Air-Barrier Components: Single-Component, Nonsag, Non-Staining, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, Use NT; SWRI validated.
   1. Basis-of-Design Product: Tremco, Inc., Spectrem 1.
   2. Volatile Organic Compound (VOC) Content: 1 g/L or less.
   3. Volatile Organic Emissions (VOE): GREENGUARD certified, it has met the world's most difficult and complete standards for low emissions of VOC's into indoor air.
   4. Adheres to California Department of Public Health (CDPH) Standard Method V1.1-2010.
   5. Color: Purple.

I. Joint Sealant for Exposed or Concealed Air-Barrier Components: Single-Component, Nonsag, Moisture-Cure, Polyurethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, Use NT; SWRI validated.
   1. Basis-of-Design Product: Tremco, Inc., Dymonic 100.
   2. Volatile Organic Compound (VOC) Content: 40 g/L or less.
   3. Volatile Organic Emissions (VOE): GREENGUARD certified, it has met the world's most difficult and complete standards for low emissions of VOC's into indoor air.
   4. Adheres to California Department of Public Health (CDPH) Standard Method V1.1-2010.
   5. Color: Green.

2.06 FASTENERS

A. Screws for Fastening Factory Fluid-Applied Air and Water Barrier Panels to Cold-Formed Metal Framing: Steel drill-screws, ASTM C 1002, in length recommended by sheathing manufacturer for sheathing thickness, with organic-polymer corrosion-protective coating having a salt-spray resistance of more than 48 hours according to ASTM B 117.

B. Screws for Fastening Factory Fluid-Applied Air and Water Barrier Panels to Wood Framing: Wood screws, ASTM C 1002, in length recommended by sheathing manufacturer for sheathing thickness, with organic-polymer corrosion-protective coating having a salt-spray resistance of more than 48 hours according to ASTM B 117.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Framing Examination: Examine framing to determine if work is ready to receive factory fluid-applied air and water barrier panels.
   1. Verify surface flatness tolerances and framing spacing comply with Project requirements.
   2. Verify adequate support is provided for factory fluid-applied air and water barrier panel edges.
   3. Proceed with work once conditions meet manufacturer's written recommendations.

B. Adjacent Substrate Examination: Prior to installation of accessory materials, examine adjacent substrates to receive transition treatment.
   1. Verify substrates are sound, free of contaminants, adequately cured or aged, compatible with proposed transition materials, and free of obstructions or impediments that would result in failure of transition adhesion and failure of air-barrier assembly to perform in accordance with Project requirements.
   2. Verify concrete and masonry surfaces are visibly dry, have cured, and are free from release agents, curing agents, and other contaminates.
      a. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   3. Verify masonry joints are filled with mortar and struck flush.

C. Proceed with installation once conditions meet manufacturer's written recommendations and after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean, prepare, and treat portions of work not requiring factory fluid-applied air and water barrier panel substrate in accordance with air-barrier manufacturer's written instructions.
   1. Mask adjacent finished surfaces.
   2. Remove contaminants and film-forming coatings from substrates.
   3. Remove projections and excess materials and fill voids with substrate patching material.
   4. Prepare and treat joints and cracks in substrate per ASTM C 1193 and membrane air-barrier manufacturer's written instructions.

3.03 INSTALLATION - FACTORY FLUID-APPLIED AIR AND WATER BARRIER PANELS

A. Discard each factory fluid-applied air and water barrier panel with damage that compromises membrane continuity or impairs performance as an air-barrier and is unable to be repaired according to manufacturer’s repair instructions.
   1. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Comply with ASTM C 1280, GA-253, and manufacturer's written instructions.
   1. Fasten factory fluid-applied air and water barrier panels to wood framing with screws.
   2. Fasten factory fluid-applied air and water barrier panels to cold formed metal framing with screws.
   3. Install panels with 3/8-inch gap where non-load-bearing construction abuts structural elements.
   4. Install panels with 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

C. Cut factory fluid-applied air and water barrier panels at penetrations, edges, and other obstructions of work to allow for application of air-barrier accessory materials. Fit factory fluid-applied air and water barrier panels closely against abutting construction.

D. Install factory fluid-applied air and water barrier panels with long dimension perpendicular or parallel to framing. Abut ends and edges of factory fluid-applied air and water barrier panels centered over face of framing members. Offset factory fluid-applied air and water barrier panel joints by not less than one stud spacing.
   1. Apply factory fluid-applied air and water barrier panels in pieces sized to provide minimum number of joints and optimum sheathing board arrangement. Arrange joints so that panels do not span between fewer than three support members.

2. Do not bridge building expansion joints; cut and space edges of factory fluid-applied air and water barrier panels to match spacing of structural support elements.

E. Fasteners: Space fasteners maximum 8 inches o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of factory fluid-applied air and water barrier panels and as required in indicated fire-resistance-rated designs.
1. Apply fasteners so heads are seated flush to the board product air-barrier membrane surface without breaking or punching through the surface.
2. Securely attach sheathing boards to substrate by fastening as indicated, complying with the following:
   a. ICC-ES evaluation report for fastener.
3. Use fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections.

F. Coordinate factory fluid-applied air and water barrier panel installation with flashing, joint-sealant, and air-barrier accessory material installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

G. Coordinate factory fluid-applied air and water barrier panel installation with materials installed over panels such that factory fluid-applied air and water barrier panels are not exposed to precipitation or left exposed at end of the workday when rain is forecast.

H. Do not cover factory fluid-applied air and water barrier panels until sealants and accessory trims have cured and inspected by the testing agency.

I. Correct deficiencies in or remove factory fluid-applied air and water barrier panels that do not comply with requirements; repair substrates and reapply air-barrier components.

3.04 INSTALLATION - ACCESSORY MATERIALS

A. General: Install factory fluid-applied air and water barrier panels, transition strips, and accessory materials according to factory fluid-applied air and water barrier manufacturer's written instructions. Install strips and transition strips to form, connect, and seal membrane air-barrier material to adjacent components of building air-barrier system, including, but not limited to, roofing system air-barrier, exterior fenestration systems, door framing, and other openings.

B. Sealants: Apply sealants in accordance with manufacturer’s installation instructions on a per-assembly basis.

C. Seal punctures, voids, and seams. Patch with membrane strips extending 6 inches beyond repaired areas.

D. Connect and seal exterior wall air-barrier membrane continuously to subsequently installed 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.

E. Wall Openings Transition Assembly Installation: Apply opening transition assembly so that a minimum of 3 inches of coverage is achieved over factory fluid-applied air and water barrier panels.

F. Rough Openings: Treat rough openings with sealant or accessory products according to manufacturer installation instructions.

G. Flashings: Seal top of through-wall flashings to factory fluid-applied air barrier air and water barrier panels with continuous transition strips of type recommended by sheet air barrier manufacturer for type of flashing.

3.05 FIELD QUALITY CONTROL

A. Testing Agency:
1. Inspections: Air-barrier materials, accessories, and installation shall be inspected for compliance with requirements and photo documentation of conditions to be concealed by subsequent Work.

B. Prepare and issue inspection reports to the architect and owner at intervals established in the preinstallation conference.

3.06 CLEANING AND PROTECTING

A. Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.

B. Clean spills, stains, and overspray resulting from application, utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.

C. Protect factory fluid-applied air and water barrier panels from damage from subsequent work. Protect membrane materials from exposure to UV light for period in excess of that acceptable to membrane air-barrier manufacturer; Contractor shall replace overexposed materials at their expense and retest.

END OF SECTION 07 27 26

SECTION 07 42 43
ACM WALL PANEL SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Application of prefabricated Aluminum Composite Material (ACM) wall panel system with integral reveals and related accessories.

1.02 RELATED SECTIONS

A. Section 05 40 00 - Cold-Formed Metal Framing.

B. Section 07 21 00 - Thermal Insulation.

C. Section 07 27 26 - Gypsum Air and Vapor Barrier Sheathing System.

D. Section 07 62 00 - Sheet Metal Flashing and Trim.

E. Section 07 92 00 - Joint Sealants.

1.03 REFERENCES

A. Aluminum Association (AA)
   1. AA-M12C22A41: Anodized - Clear Coating
   2. AA-M12C22A44: Anodized - Color Coating
   3. Aluminum Design Manual

B. Aluminum Society of Civil Engineers (ASCE)
   1. ASCE/SEI 7 Minimum Design Loads for Buildings and Other Structures

C. American Architectural Manufacturer's Association (AAMA):
   1. AAMA 501 Methods of Tests for Exterior Walls
   2. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

D. American Society for Testing and Materials (ASTM) International:
   1. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
   2. ASTM D1781 Standard Test Method for Climbing Drum Peel for Adhesives
   3. ASTM D1929 Standard Test Method for Determining Ignition Temperature of Plastics
   4. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
   5. ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
   6. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference
   7. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Wall, and Doors By Uniform Static Air Pressure Difference
   8. ASTM E1233 Standard test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential

E. National Fire Protection Association (NFPA):
   1. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.04 SYSTEM DESCRIPTION

A. Provide a watertight Rout and Return Dry panel system, as detailed on the drawings. The panel system must consist of a dry gasketed interlocking extrusion system. Any panel system utilizing a continuous field applied exposed or concealed sealant within the joinery is unacceptable.

B. The panel system as detailed shall consist of concealed dry gasketed perimeter extrusions, extruded stiffeners, gaskets, fasteners and may consist of related flashings (where architectural

drawings indicate they are to be furnished under this specification section), sealants between jamb panels and previously installed adjacent construction, and other miscellaneous accessories as required for a complete watertight installation. Assembly shall be water and airtight without reliance on a membrane or air barrier.

C. The panel system shall be designed to provide controlled drainage to the exterior face of the wall for any leakage of water occurring at joints and/or condensation taking place within the wall system.

1.05 PERFORMANCE REQUIREMENTS

A. Load Combinations: Panel system shall be designed and installed to withstand the design wind load based on the International Building Code (IBC) and local building codes while maintaining allowable deflection, thermal movement and performance as defined within this specification.

B. Deflection Design Requirements: Panel system shall not exceed the following deflection limits when subjected to the design wind loads, acting inward and outward.
   1. Perimeter Framing Deflection: Normal to the plane of the wall between structural supports, deflection of the attached perimeter-framing members shall not exceed L/175 of span length or 3/4", whichever is less.
   2. Panel Deflection: Deflection at the mid span of the panel shall not exceed L/60.

C. Thermal Movement: Make allowances for free and noiseless vertical and horizontal thermal movement due to the contraction and expansion of component parts, for an ambient temperature range from -20 degrees F to +160 degrees F with a maximum +180 degree F surface temperature.

D. System Test Requirements: Panel system furnished under this section shall have been tested. If comparable tests are not available, mockups shall be constructed and tests performed. In either case, an independent laboratory approved by the architect shall conduct the tests. Test results shall meet or exceed the following without reliance on a membrane per AAMA 501:
   1. ASTM E283 - Air Infiltration: When tested in accordance with ASTM E283, the air infiltration at 6.24 psf must not exceed 0.06 cfm per square foot of wall area.
   2. ASTM E331 - Static Water Penetration: When tested at a differential static pressure of 15.0 psf for 15 minutes, in accordance with ASTM E331, any uncontrolled water passing into the room-side beyond the interior barrier of the wall system shall not be permitted. The panel system shall be designed to provide controlled drainage to the exterior face of the wall for any leakage of water occurring at joints and/or condensation taking place within the wall system.
   3. AAMA 501.1 - Dynamic Water Penetration: Shall be tested in accordance with AAMA 501 with a slipstream velocity, creating a pressure on the wall equivalent to 15.0 psf with a water spray rate of 5 gallons per hour per square foot for 15 minutes with no uncontrolled water leakage to the room-side.
   4. ASTM E330 - Structural Performance: When tested to a minimum design load of 30 PSF, the panel system must meet or exceed the following criteria:
      a. Deflection do not exceed limitations as defined within this specification
      b. Anchor points deflection shall not exceed 1/16 inch in any direction.
      c. At 150% design load; no permanent deformation exceeding L/1000 or failure to structural members is permitted.
   5. AAMA 501.4 - Interstory Drift: No failure or deterioration of the system when laterally racked to 3/4 inch in both directions and repeated for three (3) cycles. System must pass the ASTM E331 static water test as previously described, following the seismic racking.

E. Fire Performance: Provide Fire Retardant core composite material that has been evaluated and is in compliance with code requirements specified herein.
   1. ACM System shall meet the requirements of the Intermediate Scale Multi-story test, NFPA 285.

1.06 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - Submittal Proceedures

B. Shop Drawings: Submit CAD generated shop drawings showing profiles of panel units, details of forming, joint supports, anchorages, trim, flashings, sealants and accessories. Show details of weatherproofing at edge terminations, show elevations, and layout of entire work.

C. Samples: Submit samples for color selection and verification of panel system as directed:
   1. Color Samples: Submit two (2), 3 inch x 4 inch samples of each color and finish.
   2. Panel System Assembly: Submit a 16 inch x 16 inch sample of panel system, complete with factory applied edge treatment, fabricated into units representative of the actual system. Sample need not be in the specified color.

D. Test Reports: Submit certified test reports as defined within this specification.

E. Report of Approval: ICC-EC Evaluation Report or equivalent for the ACM material provided.

F. Approved Fabricator Certificate.

1.07 QUALITY ASSURANCE

A. Qualifications
   1. ACM Manufacturer Qualification: Company with minimum of ten (10) years of continuous experience manufacturing ACM of the type specified in North America. Manufacturer shall have an ICC-ES Research Report for the type of material specified.
   2. Panel System Fabricator: Panel system fabricator shall assume undivided responsibility for all components of the panel work, and shall demonstrate no less than ten (10) years successful experience of similar panel work in both scope and size to this project.
   3. Panel System Installer: Installer shall be a firm that has at least five (5) years of experience with exterior wall applications of similar scope and size to this project and who has undergone training at ESC training facility for the installation of ACM Exterior panels systems.

B. Regulatory Code Agencies Requirements: Provide ACM system which have been evaluated and are in compliance with the following, where required:
   1. International Code Council (ICC)
   2. City of Los Angeles (Research Report)

C. ACM Fabricator must hold a valid certificate as an approved fabricator as certified by the LOS ANGELES DEPARTMENT OF BUILDING AND SAFETY.

1.08 WARRANTY

A. Fabricator’s standard warranty: Fabricator’s standard form in which fabricator agrees to repair or replace components of metal faced assemblies that fail in materials or workmanship within specified warranty period of 2 years.

B. Warranty only available when material installed by an installing contractor trained and approved by the fabricators representatives.

C. Special 20 year Warranty on panel finishes: Manufacturers standard form in which manufacturer agrees to repair finish/replace metal-faced composite wall panels that show evidence of deterioration of factory applied finishes within specified period.

PART 2PRODUCTS

2.01 ACM MANUFACTURES

A. Basis-of-Design: 3A Composites USA, Inc
   1. Prouct: Alucobond Plus Wall and Soffit Panels

B. Requests for equal or better substitutions will be considered in accordance with the provisions of Section 01 63 00 - Product Substitution Procedures.

2.02 APPROVED SYSTEM FABRICATORS

A. Elward Systems Corporation; located at 680 Harlan St., Lakewood CO; Contact Scott Jawor Phone: (760) 586-2496; Request information: sjawor@elward.com; Web: www.elward.com

B. Alternate Manufacturers and System Fabricators
   1. Alternate system fabricators must meet all the criteria of this specification.

2. “Dry-type” Systems utilizing ACM splines within the system joints will not be an acceptable alternative for a Rout and Return Dry system

2.03 ACM MATERIAL

A. ACM Material Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products that are laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. ACM Thickness: 4mm

C. ACM Face Sheets: 0.020” thick aluminum

D. ACM Finish:
1. Panel Finish: Color to be custom PVDF 3-coat finish.

E. ACM Core:
1. Fire Retardant core material product acceptable for use:

F. Fire Performance:
1. ASTM E84: ACM shall have a flame spread index of 25 or less when tested in the maximum thickness intended for use.
2. ASTM E84: ACM shall have a smoke developed index of 450 or less when tested in the maximum thickness intended for use.
3. NFPA 285: ACM shall have an Intermediate Scale Multi-story test showing that the ACM material has met the conditions of acceptance.

G. Bond Integrity: Tested for resistance to delamination as follows:
1. Peel Strength (ASTM D1781): 22.5 in-lb/in (100 N-m/m) minimum as manufactured.
2. No degradation in bond performance after 8 hours of submersion in water at 212°F or 21 days of immersion in water at 70°F.
3. Thermally bonded to the core material in a continuous process under heat, pressure, and tension.

2.04 ALUMINUM EXTRUSION MATERIAL

A. Perimeter Extrusions
1. Alloy : AA-6063-T6
2. Color: Extrusion color shall be painted to match panel finish

B. Stiffeners
1. Alloy: AA-6063-T6

2.05 WALL PANEL SYSTEM

A. Dry Joint System:
1. System must provide an open panel joint design with interlocking gasketed extrusions, designed to provide a weather resistant system utilizing internal chambers and cavities to prevent air and water infiltration. System shall maintain a dry cavity and perform its weatherability without reliance of an air/water membrane as tested per AAMA 501.
2. The panel system shall consist of approved ACM from one of the suppliers above, and an engineered panel system of custom aluminum extrusions as specified herein

B. Perimeter Extrusions: Extruded aluminum with integral weather-stripping as detailed on drawings, so as to provide the following essential features:
1. Rout and return the ACM on all perimeters. “Continuous Edge Grip” (CEG) is not acceptable.
2. Exposed edge of the ACM shall be protected inside an extruded aluminum pocket.
3. Maximum overall panel thickness, including the attachment shim space, shall not exceed 2”.
4. The ACM shall be mechanically attached to all perimeter extrusions. The mechanical fastener must not penetrate any portion of the outer (exterior) skin of the aluminum composite material. Attachment of the ACM to the perimeter extrusions with structural

silicone is not allowed.

5. Do not substitute sealants for dry gasketing shown at the metal panel joinery.
6. The use of “Dry-type” systems using perimeter clips for attachment and splines within the panel joints will not be acceptable. System must utilize continuous perimeter extrusions with a male-female connection at the vertical and horizontal joints

C. Stiffeners: Panel stiffeners to be spaced to maintain deflection limitations at design load. Stiffeners are to be mechanically fastened to the perimeter extrusion and shall be bonded to the rear face of the ACM using structural silicone or high strength double-sided bonding tape of sufficient size and strength to maintain panel’s specified deflection under load.

D. Panel Joint Reveals: Joint size between the faces of the perimeter extrusions shall be 1/2 inch, nominal.

E. System Sealants: Sealants and gaskets within the panel system shall be per sealant manufacturer's standards.

F. Fasteners:
1. Attachment of the panel system to the primary panel structural supports shall be made using a Drill-Flex Fastener by ELCO Textron Inc.
2. Typical joinery shall be attached with concealed fasteners. When exposed fasteners are required in isolated conditions, the fastener shall be obscured in the panel joinery.

2.06 FABRICATION

A. Shop fabricate panels to sizes and joint configurations as indicated on the approved ACM System Fabricator’s shop drawings. Field fabrication of panels is not allowed.

B. Fabrication Tolerances: Measured when surface temperature is at 70°F
1. Width: +/- 0.040 inches
2. Length: +/- 0.040 inches
3. Squareness: +/- 0.070 inches

PART 3EXECUTION

3.01 DELIVERY AND STORAGE

A. Delivery: Deliver fabricated units and component parts identified per erection drawings.

B. Protection of Surfaces: Protect surfaces from damage during shipping and erection. Inspect work for damage upon delivery - no damaged work permitted on job site.

C. Storage: Coordinate with General Contractor for storage space.

D. Panel Penetrations: Penetrations including those shown on the Architectural Drawings that are required by other trades shall be done by the trade involved, unless noted otherwise.

3.02 SUBSTRATE INSPECTION

A. Examine the substrate and ensure that the substrate is structurally sound and within the tolerances specified within this section. If there are deficiencies which inhibit cladding insulation, do not proceed with cladding installation until deficiencies have been addressed.

B. Substrate Tolerances: The General Contractor is responsible for providing a substrate with a tolerance of 1/4 inch in 20 feet, on level, plumb, and location control lines as indicated and within 1/8 inch offset of adjoining faces of alignment of matching profiles tolerances are noncumulative.

3.03 INSTALLATION

A. Install in compliance with manufacturer’s product data, including shop drawings, installation instructions, technical bulletins, and special detailing pertaining to any specific condition.

B. Pay special attention to panel directionality when using metallic finishes (grain). Failure to do so my result in color variation.

C. Erect panel work in a square, plumb, straight, true, and accurately fitted manner.

D. Do not install component parts, which are observed to be defective, including warped, bowed, dented, abraded and/or broken members.

E. Do not cut, trim, weld, or braze component parts during erection, in a manner which would damage finish, decrease strength, or result in a visual imperfection or a failure in system performance. Return component parts that require alteration to shop for re-fabrication, if possible, or for replacement by new parts.

F. Separate contact of dissimilar metals with use of bituminous paint, approved plastic shims (i.e. non-porous shims), or other approved methods as defined within the Aluminum Design Manual (ASD). Use gasketed or approved coated fasteners where needed to eliminate the possibly of corrosive or electrolytic action between metals.

G. Anchor panels securely in accordance with the approved shop drawings to allow for the necessary thermal movement and structural support as specified above.

3.04 CLEANING AND PROTECTION

A. After installation of panels on a given elevation, any additional protection shall be the responsibility of the General Contractor.

B. Deposit all trash from panel shipping crates in General Contractor's furnished debris boxes.

C. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.

D. Remove protective film at time of panel installation.

E. Without damaging completed work, GC to provide protective boards at exposed external corners, which may be damaged by construction activities.

END OF SECTION

SECTION 07 54 19
PVC ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Fully Adered Polyvinyl Chloride (PVC) Membrane Roofing System consisting of:
   1. Polyisocyanurate Tapered Insulation.
   2. Roof board.
   3. White PVC roof membrane adhered to roof board.
   4. Membrane Roof Protection walking pads.

B. Roofing System over structural metal decking.

1.02 RELATED REQUIREMENTS

A. Section 05 31 00 - Steel Decking

B. Section 07 62 00 – Sheet Metal Flashing and Trim

1.03 REFERENCES

A. Current Edition of:
   1. California State Building Code
   2. American Society of Testing Materials (ASTM)
   3. National Roofing Contractors Association (NRCA)
   4. Single Ply Roofing Institute (SPRI)
   5. Roofing Applicator Handbook

1.04 SUBMITTALS

A. Literature: Copies of current relevant information pertaining to the primary components to be used in the roof system including but not limited to:
   1. Specification
   2. Membrane Manufacturer Roofing Warranty
   3. Applicator Warranty
   4. Product Data Sheets
   5. Safety Data Sheets
   6. FM/UL listings/approvals
   7. UL Environment validation of recycling claims
   8. At time of bidding, Applicator must submit written documentation that items are met as set forth in Quality Assurance 1.4A and 1.4B.

B. Samples for Verification: Representative samples of primary components to be used in the roof system.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work, including:
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of roof deck, orientation of roofing membrane.

1.05 QUALITY ASSURANCE

A. Roofing Manufacturer Qualifications:
   1. Demonstrated performance history of producing PVC roof membranes no less, in duration of years, than the warranty duration specified.
   2. Membrane must be a MINIMUM of 80 mils, exclusive of any felt backing. ASTM nominal (+/-) 10% mil thickness tolerance is not accepted.
   3. Membrane must have a fiberglass reinforced scrim for the specified adhered membrane roofing system. Polyester reinforced membranes are not accepted.
   4. Manufactured by membrane supplier and not private labeled.
   5. Manufacturer must submit evidence of 6 existing buildings within a 200 mile radius of the project location that have been performing for a minimum of 5 years.

B. Installer Qualifications:
   1. Qualified firm that has been authorized by roofing manufacturer to install all work pertaining to product manufacturer's roof system and that is eligible to receive manufacturer's warranty. Installer must be approved for a minimum of 1 years prior to bid date.

C. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Sika Sarnafil Roofing Representative, Designer, Owner's Representative, Roofing Installer and installers whose work interface with or affects roofing.
   2. Review methods and procedures related to roofing installation, including manufacturer's most current requirements.
   3. Review base flashings, special roofing details and transitions, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   4. Review governing regulations and requirements for insurance and certificates.
   5. Review temporary protection requirements for roofing system during and after installation.
   6. Deviations from the project specifications or the approved shop drawings are not permitted without prior written approval by Sika Corporation Roofing, the Owner, the Owner’s Representative, and the Designer.

D. Fire Design:
   1. Underwriters Laboratories, Inc. – Class A Assembly

E. Wind Design:
   1. Factory Mutual – FM 1-90

F. Special Design:
   1. California Energy Commission Title 24
   2. SCAQMD
   3. Energy Star
   4. CRRC

1.06 DELIVERY, HANDLING, AND STORAGE

A. Deliver roofing materials to project site in original containers with seals unbroken and labeled with product manufacturer's name or product brand name.

B. Comply with most current product data sheet requirements when handling, storing, protecting, or installing roofing materials. Including but not limited to avoiding physical damage, deterioration by sunlight, excessive moisture, or other potentially damaging conditions.

C. Store liquid materials in their original undamaged containers in a clean, dry, protected location; away from direct sunlight; within the temperature range noted on the product data sheet.

D. Handle and store roofing materials and equipment in a manner to avoid permanent deflection of deck.

1.07 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's most current requirements and warranty requirements.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required and confirmed by roofing manufacturer.

1.08 WARRANTY

A. Roofing Warranty: Shall be non-prorated and must not exclude coverage due to ponding water.
   1. Manufacturers 20 year System Warranty

B. Applicator’s Warranty: Signed by installing applicator, covering the work of a System Warranty, including all components of roofing system installation such as membrane roofing, base

flashing, fasteners and walkway products.

PART 2 PRODUCTS

2.01 PERFORMANCE / DESIGN CRITERIA

A. ASTM D4434: Type II

B. NSF/ANSI Standard 347: Platinum

C. Guarantee membrane thickness meets or exceeds specified thickness when tested according to ASTM D751

2.02 MANUFACTURERS

A. Basis of Design: Sika Sarnafil Inc., 100 Dan Road, Canton, MA 02021, Ph. 800.451.2504

B. Subject to compliance with the requirements, comparable products by the following:
   1. Garland Company
   2. Tremco
   3. Carlisle Roofing Systems Inc.
   4. Johns Manville

C. Requests for equal or better products will be considered in accordance with provisions of Section 01 33 00 - Submittal procedures.

2.03 ROOFING MATERIALS

A. PVC Sheet:
   1. Sarnafil G410 Thermoplastic PVC membrane, fiberglass scrim reinforcement, with lacquer coating.
   2. Minimum Thickness:
      a. 80 mil MINIMUM, ASTM nominal, (+/-) 10% tolerance of actual thickness, is not accepted.
   3. Exposed Face Color: EnergySmart White

B. Roof Joint
   1. Sika Emseal RoofJoint: high-movement, weldable roof to wall expansion joint.

C. Membrane Attachment Component:
   1. Sarnacol 2121 (water based adhesive)

D. Roof Board or Insulation Attachment Components:
   1. Sarnafastener #12
   2. Sarnaplate
   3. Sarnacol AD Board Adhesive (urethane based adhesive)

E. Roof Board:
   1. 1/2 inch DensDeck Prime

F. Insulation:
   1. Sarnatherm ISO Fiber Reinforced Felt Facer, Type II, Class 1, Grade 2: 2 layers of 2.6 inch boards (R-30)
   2. Tappered insulation over R30 as required for root drainage and crickets.

G. Flashing Materials:
   1. Wall/Curb Flashing:
      a. G410 PVC roof membrane
      b. Sika Sarnafil PVC Detail Membrane
      c. Sarnaclad (PVC-coated sheet metal)
   2. Miscellaneous Flashing Accessories:
      a. Sarnacorners Inside
      b. Sarnacorners Outside
      c. Sarnastack Universal
      d. Sarnastack Split
      e. Sarnareglet

f. Sarnastop
g. Stabond adhesive
h. G410 Coverstrip
i. Sarnacircles

H. Miscellaneous Materials:
1. Accessories:
a. Aluminum Tape
b. Seam Cleaner
2. Sealants:
a. Sikaflex-1a
b. Sarnafiller
c. Multi-Purpose Tape
3. Temporary Overnight Tie-ins (must be removed prior to start of next day's roofing):
a. Sarnafiller
b. Multiple layers of roofing cement and felt
c. Spray-applied, water-resistant urethane foam
d. Mechanical attachment with rigid bars and compressed sealant
4. PVC Welding Equipment:
a. Sarnamatic
b. Hand Welder

I. Perimeter Textured Membrane
1. Sarnafil G410 Textured – over completed roofing system as indicated on drawings

J. Walkway Protection:
1. Crossgrip XTRA 60 mil protection mat installed around mechanical units and as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Applicator shall verify that the work done under related sections meets the following conditions:
1. Roof drains and scuppers have been installed properly, or reconditioned, or replaced.
2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
3. All surfaces are smooth and free of dirt, debris and incompatible materials.
4. For concrete deck, verify that concrete substrate is dry and free of moisture. Verify that concrete curing compounds and debris that will impair adhesion of roofing components to roof deck have been removed.
5. All roof surfaces shall be free of water.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's most current requirements. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and flashings and from spilling or migrating onto surfaces of other construction. Remove roof drain plugs when no work is taking place or when rain is forecast.

3.03 ROOFING INSTALLATION

A. Install roofing system according to product manufacturer's most current requirements including but not limited to roofing applicator handbook, product data sheets, specifications, and or relevant technical bulletins.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. For tie-in with existing roofing, install roofing and auxiliary materials to maintain weather tightness of transitions.

3.04 SARNATHERM INSULATION / ROOF BOARD INSTALLATION

A. Coordinate installing roofing system components so insulation or roof boards are not exposed to precipitation or other sources of moisture.

B. Comply with product manufacturer's most current requirements for installing insulation or roof boards.

C. Install tapered insulation to conform to slopes indicated.

D. Trim insulation or roof boards where necessary at roof drains so completed surface is smooth and does not restrict flow of water.

E. Properly sump drains to allow membrane to sit flat without stretching or wrinkling.

F. Fill gaps exceeding 1/4 inch with insulation. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Installation Method:
   1. Mechanically Fastened: Install layer/s of insulation or roof board and secure to deck using Sarnaplates and Sarnafasteners at the spacing rate according to Sika Saranfil and Owner’s Representative/Designer.
   2. Urethane Adhered: Install layer/s of insulation or roof board and secure by adhering to substrate by using Sarnacol Urethane Board Adhesive at the spacing rate and application method according to Sika and Owner’s Representative/Designer.

3.05 ROOFING MEMBRANE INSTALLATION

A. The surface of the insulation or substrate shall be inspected prior to installation of the Sarnafil roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged insulation boards shall be removed and replaced.

B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Apply roofing with side laps shingled with slope of roof deck where possible.

D. Make sure seam areas are free of debris, dirt, and dust, overlap membrane sheets, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's most current requirements to ensure a watertight seam installation.
   1. Verify in-field weld strength of seams a minimum of twice daily, repair seam sample areas.
   2. Test lap edges with probe to verify seam weld continuity.
   3. If any tears or voids in lapped seams are found repair using appropriate approved technique.

E. Adhered System:
   1. Water Based Adhesive:
   2. Apply Sarnacol 2121 adhesive to the properly prepared substrate as required by Sika Corporation Roofing. Place membrane into wet adhesive and immediately broom and roll with minimum 100 lb steel membrane roller. Adhesive shall not be used if temperatures below 40°F are expected during application or subsequent drying time.

3.06 BASE / FIELD FLASHING INSTALLATION

A. Install all membrane and preformed flashings according to roofing system manufacturer's most current requirements.

B. Install membrane base flashing by applying bonding adhesive to substrate and underside of membrane flashing at required rate. Do not apply to seam area of flashing.

C. Flash field penetrations and inside/outside corners with appropriate prefab flashing components or by approved custom in-field fabrication technique.

D. Firmly roll membrane flashing into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of membrane flashings and mechanically anchor to substrate according to manufacturer requirements.

F. Spread continuous sealant bead leaving no gaps over deck drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.07 WALKWAY / TEXTURED MEMBRANE INSTALLATION

A. G410 Textured: Install 60 mil textured membrane product in locations indicated, adhere (except edges) to deck sheet, and hot-air weld edges.

B. Crossgrip XTRA: Install walkway product in locations indicated, loos-lay on deck sheet, and connect butt ends together.

3.08 FIELD QUALITY CONTROL

A. Arrange for roofing system manufacturer's technical personnel to inspect roofing installation upon completion.

B. Repair or remove and replace components of roofing system that do not comply with specified requirements.

C. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.09 PROTECTION

A. Protect new roofing system from damage and wear during construction period. Inspect new roofing for damage if used during construction.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART1. GENERAL

1.01 SECTION INCLUDES

A. Flashing and sheet metal work, as required, including but not limited to:
   1. Metal reglets, flashing, counter flashing, vent flashing and base flashing.
   2. Metal wall flashing and expansion joints.
   3. HVAC roof penetration flashing
   4. Downspouts and Scuppers
   5. Sheet metal trim and accessories.
   6. Metal drain pans under Water Heaters.

1.02 RELATED SECTIONS

A. Section 07 92 00 - Sealants and Caulking.

B. Section 09 90 00 - Painting

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01330.

B. Shop Drawings: Submit shop drawings showing fabrication, jointing and securing of metal to form flashings and trim. Show expansion joint details and waterproof connections to adjoining work and at obstructions and penetrations.

1.04 QUALITY ASSURANCE

A. Standards: Comply with material and installation requirements of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA), Architectural Sheet Metal Manual, unless otherwise indicated or specified.

1.05 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART2. PRODUCTS

2.01 MATERIALS

A. Galvanized Iron: Commercial quality carbon steel sheets with minimum of 0.20% copper content complying with ASTM A526; hot-dip galvanized to comply with ASTM A525, 1.25 commercial class, mill phosphatised if shown to receive paint finish. Provide twenty-four gauge minimum unless otherwise indicated.
   1. Prepainted Type: Finish coated with colored 1 mil. d.f.t. fluropolymer (Kynar) coating one side, 0.3 to 0.4 mil. other side. Vincent Metals "ColorKlad", or approved equal. Custom color as directed. Used in visually exposed locations.

B. Galvanized Steel Flashing Minimum 24 Gage typical. Heavier gages may be called out on drawings at specific locations.

2.02 LAMINATED COMPOSITION SHEET FLASHING

A. Miscellaneous Materials and Accessories:

B. Solder: For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.

C. Fasteners: Same metal as flashing/sheet metal or other non- corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

D. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non- drying, nonmigrating sealant.

F. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealers."

G. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.

H. Paper Slip Sheet: 5-lb. rosin-sized building paper.

I. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E 154.

J. Reglets: Metal units of type and profile indicated, compatible with flashing indicated, noncorrosive.

K. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

L. Flashing Compound: Federal Specifications SS-C-153, fibrated asphalt plastic cement.

M. Roofing Cement: ASTM D 2822, asphaltic.

2.03 FABRICATION

A. Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates.Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
   1. All sheet metal work is not necessarily individually described. Descriptions included are major items of those requiring detail. Provide other work, as indicated as necessary.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

D. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

2.04 ELASTIC EXPANSION JOINTS

A. Counterflashings, reglets, gravel stops, copings and edgings in stock patterns, conforming substantially to details and design as shown, are acceptable. Manufacturers: Fry Reglet Corp., Lane-Aire Corp., or others approved as equal.

B. Rain Hoods: At built-up roof penetrations by piping, framing and other constructions, provide rain hoods per SMACNA "Plate 59, Fig. C" and "Plate 60, Fig. A". Fill cavity with 1/2 inch deep minimum elastometric sealant over bond breaker.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Afco Products, Inc.
   2. Celotex Corporation
   3. International Permalite/Roofing Components Group.
   4. Manville/Roofing Systems Division.
   5. Phoenix Building Products, Inc.
   6. York Manufacturing, Inc.

PART3. PART - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
   1. Anchor sheet metal flashings in accordance with Factory Mutual Loss Prevention Data Sheet 1-40 (1985). Drive all exposed fasteners through steel/neoprene washers.

B. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

C. Install reglets to receive counterflashing in manner and by methods indicated.

D. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

E. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.

F. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

G. Where non-ferrous metal adjoins ferrous metals, flood adjoining surfaces with asphalt paint to prevent corrosion.

H. Touch-up abraded areas, where zinc coating has been damaged, with a 2 mil. coating of paint, with a high concentration of zinc dust, complying with Mil. 21035, specifically recommended by manufacturer for repair of zinc coatings on steel.

3.02 ROOFING REPAIR WORK

A. General: Install sheet metal work under direct supervision, and to the complete satisfaction of roofing applicator. Install sheet metal work watertight and weather tight throughout. Provide for expansion and contraction, free from undue stress in any part of completed work using lap-type expansion joints bedded in flashing compound.

B. For embedment of metal flashing flanges in roofing or composition flashing or stripping, extended flanges for a minimum of four inches embedment.

C. Pipe and Conduit Penetrations of Roofing: Flash with lead flashings. Flanges stripped in by roofer.
   1. At short vent pipes, flash per SMACNA, Plate 59, Figure B, with top of flashing turned down two inches inside vent pipe.
   2. At pipes extending above roof too far to completely cover with lead, extend lead flashing up pipe minimum 8" and counterflash with storm collar with draw band per SMACNA, Plate 59, Figure C. Seal top of storm collar against pipe with elastometric sealant.

3.03 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Roof hatches.

1.02 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

C. Samples: For each type of exposed factory-applied finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

1.03 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

1.04 WARRANTY

A. Provide manufacturer’s five (5) year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in other Part 2 articles.

2.02 METAL MATERIALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and mill finish.

2.03 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
   1. Manufacturers:
      a. Bilco Company (The).
      b. Milcor Inc.; a Gibraltar Company.
      c. Acudor Products Inc.
      d. Dur-Red Products
      e. Substitutions: See Section 01 63 00 - Product Substitution Procedures
   2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
   3. Type and Size: Single-leaf lid, Interior opening size - 36" X 36".
   4. Curb and Lid Material: Aluminum sheet, 2.3mm thick.
   5. Insulation: Glass-fiber board.
   6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
   7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
   8. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   9. Fabricate units to minimum height of 12 inches, above the roofing, unless otherwise indicated.
   10. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height constant.

11. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
12. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.
13. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS AND CAULKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants, joint backing and preparation of substrate surfaces.

B. Section is inclusive; see plans for location of specific sealant conditions.

1.02 RELATED SECTIONS

A. 03 30 00 - Cast-in-Place Concrete: Sealants required in conjunction with concrete work.

B. 04 20 00 - Unit Masonry: Sealants required in conjunction with masonry work.

C. 08 31 00 - Access Doors and Panels.

D. 08 80 00 - Glazing.

E. 09 30 00 - Ceramic Tile: Sealants required in conjunction with finish materials or assemblies.

1.03 REFERENCES

A. ASTM C790 - Use of Latex Sealing Compounds.

B. ASTM C804 - Use of Solvent-Release Type Sealants.

C. ASTM C834 - Latex Sealing Compounds.

D. ASTM C919 - Use of Sealants in Acoustical Applications.

E. ASTM C920 - Elastomeric Joint Sealants.

F. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

G. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).

H. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

I. 2013 California Green Building Standards Code

1.04 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations and color availability.

C. Samples: Submit six samples, 2 x 2 inch in size illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SWRI requirements for materials and installation.

B. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

C. Perform acoustical sealant application in accordance with ASTM C919.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products 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.

1.07 MOCKUP

A. Sample Joint: For each type of calked or sealed joint, prepare a sample joint not less than 12 inches long indicating completed joint preparation, installation, and finish. Approved sample

joints will be used as standard of quality for workmanship during remainder of project.

B. Locate mockups where directed.

C. Approved sample joints may remain as a part of the Work.

1.08 ENVIRONMENTAL REQUIREMENTS (SECTION 5.504.4.1)

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

B. Adhesives, adhesive bonding primers, sealants, sealant primers and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable, or SCAQMD Rule 1168 yoe limits, as shown in Tables 5.504.4.1 and 5.504.4.2. Such products also shall comply with Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene), except for aerosol products as specified in Subsection C.

C. Aerosol adhesives and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of California Code of Regulations, Title 17, commencing with Section 94507.

Table 5.504.4.1 - Adhesive VOE Limit

Table 5.504.4.2 - Sealant VOE Limit

1.09 COORDINATION

A. Coordinate work under provisions of Section 01039.

B. Coordinate the work with all sections referencing this section.

1.10 WARRANTY

A. Provide five year warranty under provisions of Section 01700.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 GENERAL

A. Staining of adjacent surfaces by sealant, calking, or accessory products is cause for rejection of material submitted or installed, and shall result in repair or replacement by Contractor at no additional cost to Owner.

B. Sealant materials shall resist deterioration due to ultra-violet radiation, and shall be colorfast.

2.02 SEALANTS

A. Acrylic Latex (Type A): ASTM C834; permanently flexible, waterproof, single-component, odorless, non-bleeding, non-sagging; Product: Bostik Chem-Calk 600.

B. Silicone Sanitary (Type B): ASTM C920; Federal Specification TT-S-001543A, Class A; mildew-resistant, single-component, acetoxy; Products: Polymeric Systems PSI-611, GE Silicones Sanitary 1700.

C. Two-Part Polyurethane (Type C): ASTM C920, Type M, Grade NS, Class 25; Federal Specification TT-S-00227E, Type 11, Class A; two-component, non-sagging; Product$: Polymeric Systems Flexiprene 2000, Sikaflex 2C/NS by Sika.

D. One-Part Polyurethane (Type D): ASTM C920, Type S, Grade NS, Class 25; Federal Specification TT-S-00230C, Type II, Class A; single-component; Products: Polymeric Systems Flexiprene 1000, Bostik Chem-Calk 900.

E. Self-Leveling Polyurethane (Type E): ASTM C920, Type M, Grade P, Class 25; Federal Specification TT-S-00227E, Type I, Class A; two-component, self-leveling, traffic grade, ; Products: Polymeric Systems PSI-551/RC-2, Bostik Chem-Calk 550.

F. Latex Acoustic (Type F): Highly elastic, water-based calking compound; Product: USG Acoustical Sealant by United States Gypsum.

G. Colors:
   1. Type A: White, black, or gray, as selected by Architect.
   2. Types B and F: White.
   3. Types C and D: White, off-white, black, gray, tan, or bronze, as selected by Architect.
   4. Type E: White, black, gray, or tan, as selected by Architect.

2.03 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 D1565, round section, open 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

3.01 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials, dirt, dust, mortar, oil, and all other foreign matter that might impair adhesion of sealant. Where necessary remove grease with a solvent or degreasing agent approved for use with sealant materials.

B. Clean and prime joints in accordance with manufacturer’s instructions.

C. Perform preparation in accordance with ASTM C804 for solvent release and ASTM C790 for latex base sealants.

D. Perform preparation in accordance with manufacturer’s instructions.

E. Protect elements surrounding the work of this section from damage or disfiguration. Provide masking tape or equivalent protection to prevent sealants from contacting surfaces to remain exposed in finished work.

F. Etch concrete or masonry surfaces to remove excess alkalinity, unless manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid, neutralize with dilute ammonia solution, and rinse thoroughly with water before starting installation.

G. Allow surfaces to dry thoroughly before starting application of sealants.

3.03 INSTALLATION

A. Perform installation in accordance with ASTM C804 for solvent release and ASTM C790 for latex base sealants.

B. Install sealant in accordance with manufacturer's instructions.

C. Measure joint dimensions and size materials to achieve 2:1 width/depth ratios.

D. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

E. Sealant depth at building joints shall not exceed 1/2 inch, except where specifically indicated on drawings.

F. Joints at concrete walks, paving, slabs, and similar conditions shall be filled to a depth equal to 75 percent of the joint width, but not more than 3/4 inch deep, or less than 3/8 inch deep. Joints shall be slightly convex to permit a flush condition when sealant is compressed with light pressure.

G. Install bond breaker where joint backing is not used. Bond breaker or joint backing shall be installed to prevent sealant from bonding to back of joint.

H. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

I. Apply sealant within recommended application temperature ranges. Refer to manufacturer's recommendations when sealant cannot be applied within these temperature ranges.

J. Tool joints concave, except where indicated otherwise.

K. Seal around all openings in exterior walls and in other locations indicated or required for complete weatherproofing and waterproofing of building.

L. Match sealant type to substrate material in accordance with sealant and substrate material manufacturer’s recommendations.

M. Concrete, masonry, similar porous surfaces, and any other surface recommended by the manufacturer, shall be primed before applying sealant. Primer shall be applied as required to reach all parts of joint to be filled with sealant.

N. Do not use sealants when they become too jellied to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders will not be permitted.

O. Apply sealants with guns having proper size nozzles. Sufficient pressure shall be used to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where the use of the gun is impracticable, suitable hand tools shall be used.

P. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with eaving tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are applied.

Q. Sealants applied around exterior window and door frames, or other equivalent joints exposed on the exterior of the building, shall be painted to match the adjacent finish material. Refer to Section 09 90 00 for painting.

R. Install sealants at the exterior of the building after sandblasting and exterior painting preparation is complete.

3.04 MISCELLANEOUS SEALING AND CAULKING WORK

A. The entire extent of sealing work is not necessarily fully or individually described herein. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to drawings for conditions and related parts of the work.

3.05 CLEANING

A. Clean work under provisions of 01 70 00.

B. Clean adjacent soiled surfaces.

C. Remove excess materials from other finished surfaces as soon as sealing or calking in area is completed. Thin films of cured compound shall be removed with stripping compound known to be harmless to surfaces in contact with excess sealant. No abrasives shall be used.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Section 01 50 00.

B. Protect sealants until cured.

C. Damaged sealants shall be repaired or replaced as recommended by manufacturer, at no additional cost to Owner.

3.07 SCHEDULE

A. Type A Sealant: Use at interior locations only, to decoratively seal abutting materials not otherwise described in this schedule.

B. Type B Sealant: Use at interior locations only, where plumbing fixtures and escutcheon plates abut finish materials.

C. Type C Sealant: Use at vertical joints in concrete or masonry at the exterior of the building.

D. Type D Sealant: Use at perimeter of openings in exterior walls, including under thresholds, and all other exterior locations not specifically described in this schedule.

E. Type E Sealant: Use at areas subject to foot or vehicular traffic.

F. Type F Sealant: Use between floor and bottom plate at sound or fire rated walls; refer to drawings and sound or fire rated assembly descriptions.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

C. Accessories, including louvers, matching panels, and Infill Panels.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 09 96 00 - High-Performance Coatings

1.03 ABBREVIATIONS AND ACRONYMS

A. HMMA: Hollow Metal Manufacturers Association.

B. NAAMM: National Association of Architectural Metal Manufacturers.

C. SDI: Steel Door Institute.

1.04 REFERENCE STANDARDS

A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2022.

B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2020.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.

G. 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 2018a.

H. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames 2016.

I. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

J. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.

K. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.

L. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

M. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2023.

1.05 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Coordination:
   1. Verify that substrate conditions are as detailed in the drawings, and are acceptable for product installation in accordance with the manufacturer’s instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
      a. Exterior: Ceco Trio-E Series
      b. Interior: Ceco Legion Series
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
      a. Exterior: Curries 777-E Series
      b. Interior: Curries 707 Series
   3. Steelcraft: www.steelcraft.com.
   4. Substitutions: See Section 01 63 00 - Product Substitution Proceedures..

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   3. Door Edge Profile: Manufacturers standard for application indicated.
   4. Typical Door Face Sheets: Flush.
   5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   6. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Metal Infill Panels: Same construction, performance, and finish as doors.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.
   1. Coordinate compatibility of factory primer with field finished paint requirements.

B. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model: Full Flush.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
      e. Zinc-iron Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: 22 Gauge steel stiffeners spaced every 6" apart with injected polyurethane foam..
   3. Door Thickness: 1-3/4 inches, nominal.

C. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model: Full Flush.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
   1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
   2. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.
   3. Weatherstripping: Integral, recessed into frame edge.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Terminated Stops: Provide at interior doors; closed end stop terminated 4 inch, maximum, above floor at 45 degree angle.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10.

2.06 ACCESSORIES

A. Louvers: For flush mounting in hollow metal door transom frame
   1. Style: Inverted "Y" Blade.
   2. Louver Free Area: 50 percent.
   3. Blades and Frame: 18 gauge minimum and zinc-plated for corrosion resistance.
   4. Size: As scheduled on drawings.
   5. Finish: Factory primed and field finished to match door.
   6. Insect Screen: 18 x14 fiberglass mesh insect screen installed to the inside between the two louvers.
   7. Manufacturers:
      a. Trademark Hardware; 800core: tmhardware.com.
      b. Activar; 700TL: activarcpg.com.
      c. Or Approved Equal.

B. In-fill Panels:
   1. Construct from 0.032 in. (0.8 mm) minimumthick steel, of the same type specified for the frame product, laminated to each face of 1/2" cement board backing.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Astragals for Double Doors: Specified in Section 08 7100.

E. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

F. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

G. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 71 00.

D. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal access doors for access to equipment and where access in walls or ceilings is required for service.

1.02 RELATED SECTIONS

A. Refer to Plumbing, Mechanical, and Electrical Sections for Access Door requirements for access to and servicing of plumbing, mechanical and electrical equipment not specified in this section.

B. Section 05 40 00 - Cold Formed Metal Framing

C. Section 05 50 00 - Metal Fabrications

D. Section 06 10 00 - Rough Carpentry

1.03 QUALITY ASSURANCE

A. Qualifications of Installers: For actual installation of access doors, use only skilled installers who are completely familiar with the recommended methods of installation and the requirements of this Work.

B. Where fire-rated doors are indicated on plans, provide doors in accordance with specifications and procedures of Underwriters' Laboratories, Inc.

1.04 SUBMITTALS

A. Comply with provisions of Section 01 33 00.

B. Submit samples of Access Doors prior to installation.

C. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver a letter signed by an officer of the firms manufacturing the doors certifying that the materials delivered to this Work comply in all respects with the provisions of this Section of these Specifications.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protection: Use all means necessary to protect doors before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements.

1.06 WARRANTY

A. Furnish a written guarantee. Access Doors will be guaranteed for the life of the door from the original installation

B. Guarantee shall cover the cost of replacement of defective doors, rehanging and refinishing of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acudor Products, Inc.

B. Nystrom Products Company

C. Karp Access Products

2.02 MATERIALS

A. Restroom and Locker Room walls and ceilings:
   1. Reference Karp Model DSC - 214M
   2. Type 304 Stainless Steel with No 4 Satin Finish
   3. Hinges are to be concealed pivoting rod type.
   4. Locks flush type with allen wrench operated stainless steel cam and studs

B. Non-Restroom Recessed type access door for flush installation in walls and ceilings to receive new surface finish materials in door recess.
   1. Reference Karp Model DSC - 210
   2. Access door frame to be 13 ga steel and door shal be 16 ga steel.
   3. Hingers are to be concealed pivoting rod type.
   4. Locks flush type with allen wrench operated stainless steel cam and studs.

2.03 ACCESSORIES

A. Provide door insert to match existing adjacent surface. Where door is provided as access under wood flooring provide insert to match existing adjacent wood surfaces.

2.04 FABRICATION

A. All access doors are to be factory fabricated to the sizes indicated on the drawings.

B. Verify size of openings before fabrication. No allowance will be made for doors delivered that do not fit. Any additional expense for replacement of wrong size doors is the responsibility of the Contractor and not the Architect or District .

PART 3. EXECUTION

3.01 EXAMINATION

A. Before installation of access doors, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that access doors may be installed in accordance with the original design, the referenced standards, and all pertinent codes and regulations

C. Field verify all dimensions before ordering or fabrication. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. Install access doors according to manufacturers instruction.

B. Install all access doors in strict accordance with all pertinent codes and regulations, the original design, and the referenced standards, hanging square, plumb, and straight and firmly anchored into position for long life under hard use.

3.03 ADJUSTING

A. Adjust access doors which do not swing or operate freely

B. Replace damaged access doors with new doors.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior coiling doors.

B. Interior non-fire-rated coiling doors.

C. Electric operators and control stations.

1.02 RELATED REQUIREMENTS

A. Division 26. Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, and installation of control station and wiring

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bases of Design Manufacturer:
   1. Cornell Iron Works, Inc: www.cornelliron.com.

B. Substitutions: Refer to Section 01 63 00 - Product Substitution Requirements

2.02 COILING DOORS

A. Exterior Coiling Door:Type Thermiser Max ESD30: Motor Operate slat curtain.
   1. Design Requirements:
      a. Doors to withstand up to 40 PSF design wind load.
   2. Curtain:
      a. Slat Material: No. 6F
         1) Galvanized Steel/Galvanized Steel: Manufacturer recommended gauge based on performance requirements. Minimum 24/24 gauge, Grade 40, ASTM A 653 galvanized steel zinc coating
      b. Insulation: 7/8 inch (22 mm) foamed-in-place, closed cell urethane
      c. Total Slat Thickness: 15/16 inch (24 mm)
      d. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
      e. R-value: 8.0
      f. Slat Finish:
         1) SpectraShield Ultra – Ultra Powder Coat to be applied as a protective top coat over SpectraShield finish. Top coat is a polyester based structured wear resistant clear powder coat of 2.5-3.5 mils cured film thickness. ASTM D-3363 pencil hardness: 2H or better. Tested per ASTM B117. Base coating of SpectraShield color as selected by Architect from manufacturer's color range, more than 180 colors.
   3. Endlocks: Fabricate interlocking sections with high strength [nylon] [galvanized cast iron] endlocks on alternate slats each secured with two ¼" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.
   4. Insulated Bottom Bar
      a. Air Infiltration Certification Label: Must be affixed to bottom bar.
   5. Guides:
      a. Thermal break required. Minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar. Top 16 ½" (419.10 mm) of coil side

guide angles to be removable for ease of curtain installation and as needed for future curtain service.
b. Finish: SpectraShield® Coating System; Color to match slats.

6. Counterbalance Shaft Assembly:
   a. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
   b. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.
7. Brackets:
   a. Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
   b. Finish: SpectraShield® Coating System; Color to match slats.
8. Hood:
   a. Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
   b. Finish: SpectraShield® Coating System; Color to match slats.

B. Interior Non-Fire-Rated Coiling Door:Type ESD 10 Motor Operated slat curtain.
1. Curtain:
   a. Slats
      1) Galvanized Steel: No. 5F (prefinished with GalvaNex™ Coating System), Grade 40 steel, ASTM A 653 galvanized steel zinc coating. Gauge as required to meet performance requirements.
   b. Finish:
      1) SpectraShield Ultra – Ultra Powder Coat to be applied as a protective top coat over SpectraShield finish. Top coat is a polyester based structured wear resistant clear powder coat of 2.5-3.5 mils cured film thickness. ASTM D-3363 pencil hardness: 2H or better. Tested per ASTM B117. Base coating of SpectraShield color as selected by Architect from manufacturer’s color range, more than 180 colors.
2. Endlocks:
   a. Alternate slats each secured with two ¼” (6.35 mm) rivets. Fabricate interlocking sections with high strength nylon.
3. Bottom Bar:
   a. Extruded Aluminum: Extruded aluminum alloy 6063-T5, Black anodized finish.
4. Guides:
   a. Structural steel angles. Provide removable bellmouths, and bottom bar stoppers of same material.
   b. Finish: SpectraShield® Coating System; Color to match slats.
5. Counterbalance Shaft Assembly:
   a. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.
   b. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. (110 N). Provide wheel for applying and adjusting spring torque.
6. Brackets:
   a. Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures
   b. Finish: SpectraShield® Coating System; Color to match slats.
7. Hood:
   a. Galvanized steel with reinforced top and bottom edges. Provide intermediate support brackets as required.

b. Finish: SpectraShield® Coating System; Color to match slats.

2.03 OPERATION

A. Motors – Model EverGard (TENV Gear Head) Operator:
1. Electric Motor Operator with back-up power control box.
2. Limited Duty (up to 10 cycles per hour).
3. cULus listed.
4. 120v AC input power with auto switch to 24v DC back-up power, 1/2 Horsepower or as recommended by manufacturer.
5. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, emergency manual chain hoist and control station.
6. Motor shall be high starting torque, industrial type, with overload protection.
7. Primary speed reduction shall be heavy-duty gears running in maintenance free, sealed gear box with mechanical braking to hold the door in any position.
8. The emergency manual chain hoist assembly is automatically disengaged when motor is energized.
9. A disconnect chain shall not be required to engage or release the manual chain hoist.
10. Operator drive and door driven sprockets shall be provided with minimum #50 roller chain.
11. Operator shall be capable of driving the door at a speed of up to 9” per second or as recommended for door size
12. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door.
13. The motor shall be removable without affecting the limit switch settings.
14. The electrical contractor shall mount the control stations and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.
15. Back-up power to provide minimum 10 open/close cycles and 48 hr. stand-by.
16. (2) 12v rechargeable lead sealed batteries
17. Programmable battery load testing
18. Monitoring points for open/close position, AC power loss and battery low voltage
19. Wiring whip to connect control box and motor (up to 120’-0”)
20. Emergency Push Button (EPB): Surface mounted, single green push button station wired for emergency OPEN function only.
21. Door power indicator: Flush mounted voltage monitor for battery back-up system. Flashing red light indicates low battery power and maintenance check-up. Can be located up to 150 ft. away from motor control box
22. UL325 & UL864 compliant system.
23. Control Stations:
    a. Surface mounted: "Open/Close/Stop," push buttons with keyed lock-out; NEMA 4
24. Control Operation:
    a. Momentary Contact to Close:
        1) Fail-safe, UL325-2010 Compliant Entrapment Protection for Motor Operation.
        2) Continuously monitored, wireless sensing/weather edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports to securely fasten assembly to wall construction and building framing without distortion or stress.

B. Install units in accordance with manufacturer's instructions.

C. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

D. Coordinate complete installation of electrical service.

E. Complete wiring from disconnect to unit components.

3.02 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.03 CLEANING

A. Clean installed components per manufacturer's instructions..

B. Remove labels and visible markings.

3.04 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative

B. Instruct Owner's Representative in maintenance procedures

END OF SECTION

SECTION 08 36 13
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Lock cylinders.

B. Section 26 01 00 - Electrical General Provisions: Conduit and connections.

1.03 REFERENCE STANDARDS

A. DASMA 102 - American National Standard Specifications for Sectional Doors 2018.

1.04 SUBMITTALS

A. See General Conditions, for submittal procedures.

B. Shop Drawings: Indicate plans and elevations including:
   1. Opening dimensions and required tolerances.
   2. Connection details.
   3. Anchorage spacing.
   4. Hardware locations.
   5. Installation details.

C. Product Data: Manufacturer's data sheets including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.

D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

E. Operation Data: Include normal operation, troubleshooting, and adjusting.

F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DESIGN AND PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
   1. Refer to structural drawings for project design criteria.

B. Wiring Connections: Requirements for electrical characteristics.
   1. xxx volts, xxx phase, 60 Hz

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer. Provide secondary components from source acceptable to manufacturer of primary components.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified.

1.07 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for electric motor.

C. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Model 521 manufactured by Overhead Door Corp.; www.overheaddoor.com

B. Or Approved Equal
   1. Requests for substitutions will be considered in accordance with provisions of the project General Conditions.

2.02 GLAZED ALUMINUM SECTIONAL DOORS

A. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
   1. Panel Thickness: 1-3/4 inches
   2. Center Stile Width: 2-11/16 inches
   3. End Stile Width: 3-5/16 inches
   4. Intermediate Rail Pair Width: 3-11/16 inches
   5. Top Rail Width: 3-3/4 inches
   6. Bottom Rail Width: 4-1/2 inches
   7. Stiles and Rails: 6063 - T6 aluminum.
   8. Springs: 10,000 cycles

B. Glazing:
   1. 1/2 inch Tempered Insulating glass.

C. Finish and Color:
   1. Powder Coating Finish: Color as selected by Architect from manufacturer’s standard colors.

D. Hardware:
   1. Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.

E. Lock:
   1. Interior galvanized single unit.

F. Weatherstripping:
   1. Flexible bulb-type strip at bottom section.
   2. Flexible Jamb seals.
   3. Flexible Header seal.

G. Electric Motor Operation:
   1. Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
      a. Entrapment Protection: Required for momentary contact, includes radio control operation.
         1) Electric sensing edge monitored to meet UL 325/2010.
      b. Operator Controls:
         1) Push-button and key operated control stations with open, close, and stop buttons.
         2) Surface mounting.

2.03 COMPONENTS

A. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

B. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

C. Head Weatherstripping: EPDM rubber seal, one piece full length.

D. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

E. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

3.05 CLEANING

A. Clean doors and framesand glass.

B. Remove temporary labels and visible markings.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

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SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass and spandrel glazing

B. Aluminum doors.

1.02 RELATED REQUIREMENTS

A. Section 07 27 26 - Gypsum Air and Vapor Barrier Sheathing System: Sealing framing to water-resistive barrier installed on adjacent construction.

B. Section 07 92 00 - Joint Sealants and Caulking: Sealing joints between frames and adjacent construction.

C. Section 08 56 59 - Transaction Window: Operable window within glazing system.

D. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems 2014.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

D. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors 2002 (Reapproved 2018).

E. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 33 00 for submittal requirements.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

C. Product Data:
   1. For components within assembly indicated, include:
      a. Construction details
      b. Material descriptions
      c. Dimensions of individual components and profiles
      d. Hardware
      e. Finishes
      f. Installation instructions

D. Shop Drawings:
   1. Plans, Elevations, Sections and Details indicate system dimensions, framed opening requirements and tolerances.
   2. Attachments to other work.

3. Expansion and contraction joint location and details
4. Installation details
5. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

E. Samples: Submit two samples with factory-applied color finish.

F. Product Test Reports:
1. Provide test reports for each type of aluminum-framed storefront used in the project.
2. Test reports must be based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency.
3. Test reports must indicate compliance with performance requirements.

G. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
1. Manufacturer must document this performance by the inclusion of test reports and calculations.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Source Limitations:
1. Obtain aluminum-framed storefront system through one source from a single manufacturer.

D. Product Options:
1. Drawings indicate size, profiles, and dimensional requirements of aluminum-framed storefront system and are based on the specific system indicated. Do not modify size and dimensional requirements.
2. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Pre-installation Conference:
1. Conduct conference at project site to comply with requirements in Section 01 30 00 - Administrative Requirements. Management and Coordination Section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

B. Packing, Shipping, Handling, and Unloading:
1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.08 FIELD CONDITIONS

A. Field Measurements:
1. Verify actual dimensions of aluminum-framed storefront openings by field measurements before fabrication.
2. Indicate measurements on shop drawings.

1.09 WARRANTY

A. See Section 01 70 00 - Contract Closeout for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide fifteen year manufacturer warranty on finish.

E. Aluminum Entrance Doors: Warranty against sagging or twisting of all doors as a result of normal usage for the lifetime of the installation.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer Comany, Inc.; Trifab® VersaGlaze® 451T Framing System
      a. Nominal Mullion System Dimensions: 2 inches wide by 4-1/2 inches deep.
      b. Glass: 1-inch Insulated.

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer Company, Inc; 500 Series.

2.03 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   2. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   3. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   4. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   5. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   6. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Thermal Barrier:
   1. Thermal break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

C. Brackets and Reinforcements:
   1. Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

D. Fasteners and Accessories:
   1. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials.
   2. Where exposed, fasteners and accessories shall be stainless steel.

E. Perimeter Anchors:
   1. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.04 GENERAL PERFORMANCE REQUIREMENTS

A. Product to comply with the specified performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction, as determined by testing of aluminum storefront systems representing those indicated for this project.

B. Aluminum storefront systems shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   1. Failure includes any of these events:

a. Thermal stresses transferring to building structure.
b. Glass breakage
c. Loosening or weakening of fasteners, attachments, and other components
d. Failure of operating units

C. Structural Requirements: Reference Structural Drawings for Project Design Criteria requirements

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
1. Glazing Stops: Flush.
2. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: See Section 08 80 00 - Glazing.

C. Glazing Gaskets:
1. Manufacturer's standard compression types.
2. Replaceable, extruded EPDM rubber.

D. Spacers and Setting Blocks:
1. Manufacturer's standard elastomeric type.

E. Bond-Breaker Tape:
1. Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

F. Swing Doors: Glazed aluminum.
1. Glass: 1-inch Insulated
2. Thickness: 1-3/4 inches.
3. Top Rail: 5 inches wide.
4. Vertical Stiles: 5 inches wide.
5. Bottom Rail: 12 inches wide.
6. Finish: Same as storefront.
7. Door Hardware: Refer to Section 08 71 00 - Door Hardware

G. Operable Window: See Section 08 56 59 - Transaction Window.

2.06 MATERIALS

A. Aluminum Extrusions:
1. Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish.
2. Not less than 0.070" (1.8 mm) wall thickness at any location for the main frame complying with ASTM B221: 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories:
1. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.

D. Reinforcing Members:
1. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating.
2. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.

E. Sealant:

1. For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Glass: As specified in Section 08 80 00.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Bituminous Paint:
1. Cold-applied asphalt-mastic paint formulated for 30-mil (0.762 mm) thickness per coat compling with non-asbestos SSPC-Paint 12 requirements.

2.07 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard Permafluor system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin (Hylar 5000® or Kynar 500®) having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Manufacturer's standard Color: Bone White.

2.08 FABRICATION

A. Fabricate framing member components that, when assembled, have the following characteristics:
1. Accommodations for thermal and mechanical movements of glazing and framing that maintain required glazing edge clearances
2. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
3. Prepare components to receive anchor devices. Fabricate anchors.
4. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
5. Arrange fasteners and attachments to conceal from view.
6. Reinforce components internally for door hardware and door operators.
7. Reinforce framing members for imposed loads.
8. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
9. Physical and thermal isolation of glazing from framing members
10. Provisions for field replacement of glazing

B. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

C. Proceed with installation only after correcting unsatisfactory conditions.

3.02 INSTALLATION

A. Install wall system in accordance with approved shop drawings and manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Set sill members in bed of sealant or with gaskets, as indicated, for weather-tight construction.

K. Install aluminum-framed storefront system and components to drain condensation, water penetrating joints and moisture migrating within aluminum-framed storefront system to the exterior.

L. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

M. Install hardware using templates.
   1. See Section 08 71 00 for hardware installation requirements.

N. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 40 00 - Quality Requirements for general testing and inspection requirements.

C. Conduct tests for air infiltration and water penetration with manufacturer’s representative present.

D. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

E. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as directed by Architect.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
   4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.20 psf.

F. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.04 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Remove excess sealant by method acceptable to sealant manufacturer.

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 56 59
TRANSACTION WINDOW

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service window units installed in storefront wall system.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants and Caulking: Sealing joints between frames and adjacent construction.

B. Section 08 43 13 - Aluminum-Framed Storefront

1.03 REGULATORY REQUIREMENTS

A. Pass-through windows of sales/service counter shall comply with the reach and access requirements of **CBC Sections 11B-227.3, 11B-305, 11B-306, 11B-308, 11B-309, and 11B-904.4.**

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer Qualification Statement.

C. Installer Qualification Statement.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least ten years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

B. Store units in area protected from exposure to weather and vandalism.

1.08 WARRANTY

A. Provide manufacturer's warranty agreeing to repair or replace units and their components that fail in materials or workmanship within two years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bases of Design: Model SCDW 1804K Service Window manufactured by C.R. Laurence Architectural Products.

B. Or Approved Equal
   1. For substitutions refer to Section 01 63 00 - Product Substitution Procedures.

2.02 SLIDING TRANSACTION WINDOW

A. Location: Install within exterior and interior storefronts as indicated on drawings.

B. Type of Use: Walk-up.

C. Window Type: Sliding, single horizontal.

1. Operation: Manual, Heavy duty ball bearing carrier for sliding window
2. Mounting: Flush with storefront, as indicated on drawings..
3. Window Outside Dimensions: As indicated on drawings.
4. Stainless SteelCounter Space: As indicated on drawings.
5. Frame Material: Heavy Duty Extruded Aluminum .
   a. Finish: Kynar.
      1) Color: Bone White to match storefront finish.
6. Sill: Manufacturer's standard type shelf.

D. Glazing: _____ _____
1. Tempered safety glazing.
2. Exterior Glazing: 1/2" insulating , clear tempered glass.
3. Interior Glazing: 1/4" tempered clear glass.

2.03 MATERIALS

A. Window members: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10aT5).

B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164 shall be aluminum or steel, providing the steel is properly isolated from aluminum.

2.04 HARDWARE

A. Hardware shall be furnished and installed by the manufacturer and shall include the following hardware:
1. Pull: Rockwell 8" straight pull #110
   a. ADA compliance: Pull handle must be mounted within accessible reach range
2. Mortise Cylinder: Adams Rite #4036
3. Thumbturn: Adams Rite #4066
4. Deadlock: Adams Rite #MS1850S-x5x
5. Pull: Rockwood Straight Pull # 110 8-inch

B. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 FINISHES

A. Fluorocarbon Coating: AAMA 2605.2.
1. Resin: 70% PVDF Kynar 500/Hylar 5000.
2. Substrate: cleaned and pretreated with chromium phosphate.
3. Primer: Manufacturer’s standard resin base compatible coating. Dry film thickness.
   a. Extrusion: Minimum 0.20 mil.
4. Color Coat: 70% PVDF, dry film thickness:
   a. Extrusion: 1.0 mil.
5. Color: To match Storefront mullions
6. Acceptable Coatings Manufacturers:
   a. PPG Industries, Inc.
   b. Valspar Corporation
   c. BASF

PART 3 EXECUTION

3.01 EXAMINATION

A. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with shop drawings and manufacturer's installation instructions.

B. Install units in correct orientation (inside/outside or secure/non-secure).

C. Anchor units securely in manner so as to achieve performance specified.

D. Set sill members and sill flashing in continuous bead of sealant.

E. Remove and replace defective work.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.04 CLEANING

A. Remove protective material from factory finished surfaces.

B. Clean exposed surfaces promptly after installation without damaging finishes.

END OF SECTION

08 11 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Door Hardware
B. Related Sections:
   1. Division 06 — door hardware installation
   2. Division 07 — sealant at exterior thresholds
   3. Division 08 — metal doors and frames, and storefront systems.
   4. Division 21 — fire and life safety systems
C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
   1. Windows.
   2. Cabinets, including open wall shelving and locks.
   3. Signs, except where scheduled.
   4. Toilet accessories, including grab bars.
   5. Installation.
   6. Rough hardware.

1.02 REFERENCES:

Use date of standard in effect as of Bid date.

A. American National Standards Institute — ANSI 156.18 — Materials and Finishes.
B. BHMA — Builders Hardware Manufacturers Association
c. DHI — Door and Hardware Institute
D. NFPA — National Fire Protection Association
   1. NFPA 80 — Fire Doors and Windows
   2. NFPA 105 — Smoke and Draft Control Door Assemblies
   3. NFPA 252 — Fire Tests of Door Assemblies
E. UL — Underwriters Laboratories
   1. UL10C — Positive Pressure Fire Tests of Door Assemblies.
   2. UL 305 — Panic Hardware
F. WHI — Warnock Hersey Incorporated
G. 2013 State of California Building Code
H. Local applicable codes
i. SDI — Steel Door Institute
J. WI — Woodwork Institute
K. AWI — Architectural Woodwork Institute
L. NAAMM — National Association of Architectural Metal Manufacturers

1.03 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Section 01 *33* 00. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule 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. Type, style, function, size, quantity and finish of hardware items.

2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Description of door location using space names and numbers as published in the drawings.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, handing, materials, fire-rating and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Date of jobsite visit.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Deviations: Highlight, encircle or otherwise identify deviations from 'Schedule of Finish Hardware' on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a. Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / California State Fire Marshal Standard 12-7-4 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

1. Note: scheduled resilient seals may exceed selected door manufacturer's requirements.
2. See 2.6.E for added information regarding resilient and intumescent seals.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions.

F. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).
   1. Permanent keys and cores: secured delivery direct to Owner's representative.
B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.
C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.06 PROJECT CONDITIONS AND COORDINATION:

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
   1. Location of embedded and attached items to concrete.
   2. Location of wall-mounted hardware, including wall stops.
   3. Location of finish floor materials and floor-mounted hardware.
   4. Manufacturer templates to door and frame fabricators.
C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation. Do not order hardware until the submittal has been reviewed by the frame and door suppliers for compatibility with their products.
D. Prior to submittal, carefully inspect existing conditions at each opening to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict or incompatibility between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
   1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.07 WARRANTY

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:
   1. Locksets: Three Years
   2. Exit Devices: Three Years Mechanical and One Year Electrical
   3. Closers: Thirty Years Mechanical and Two years Electrical
   4. Hinges: One year
   5. Continuous Hinges: Life of the Installation
   6. Extra Heavy-Duty Cylindrical Locks: Seven Years
   7. Other Hardware: Two years

1.08 COMMISSIONING:

A. Conduct these tests prior to request for certificate of substantial completion:
   1. With installer present, test door hardware operation with climate control system both at rest and while in full operation.

1.09 REGULATORY REQUIREMENTS:

A. Doors/doorways as part of an accessible route shall comply with CBC Sections 11B-404.

B. The clear opening width for a door shall be 32" minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. CBC Section 11B 404.2.3. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. CBC Section 11B-404.2.7.

C. The force for pushing or pulling open a door shall be as follows: CBC Section 11B-404.2.9.
   1. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). These forces do not apply to the force required to retract the latch bolts or disengage other devices that hold the door in a closed position.
   2. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.

D. Door closing speed shall be as follows: CBC section 11B-404.2.8
   1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum.
   2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.

E. Thresholds shall comply with CBC Section 11B-404.2.5.

F. Floor stops shall not be located in the path of travel and 4" maximum from walls.

G. Hardware (including panic hardware) shall not be provided with 'Night Latch' (NL) function for any accessible doors or gates unless the following conditions are met:
   1. Such hardware has a 'dogging' feature.
   2. It is dogged during the time that the facility is open.
   3. Such 'dogging' operation is performed only by employees are their job function (non-public use).

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM	MANUFACTURER	ACCEPTABLE SUBSTITUTIONS
Hinges	(HAG) Hager	Ives, Stanley, Bommer
Continuous Hinges	(MAR) Markar	Ives, Pemko, Roton
Key System	(SCH) Schlage	District Standard
Locks	(VON) Von Duprin	District Standard
Exit Devices Mullions	(VON) Von Duprin	District Standard
Closers	(LCN) LCN	Norton
Auto Flush Bolts	(IVE) Ives	DCI, Trimco
Coordinators	(IVE) Ives	DCI, Trimco
Silencers	(IVE) Ives	Trimco, DonJo
Push & Pull Plates	(IVE) Ives	Trimco, DonJo
Kickplates	(IVE) Ives	Trimco, DonJo

Stops & Holders	(IVE) Ives	Trimco, DonJo
Overhead Stops	(GLY) Glynn-Johnson	DCI
Thresholds	(PEM) Pemko	NGP, Reese
Seals & Bottoms	(PEM) Pemko	NGP, Reese
Special Strikes	(SBU) Specialized Builders Hardware	or Equal
Fillers	(SBH) Specialized Builders Hardware	or Equal

2.02 HANGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless-steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.
   1. Out swinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
   2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:
   1. Pinned steel/stainless steel type: continuous stainless steel, 0.25" diameter stainless-steel hinge pin.
      a. Use engineered application-specific wide-throw units as needed to provide maximum swing degree of swing, advise architect if required width exceeds 8".
   2. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation on the back of the hollow metal frame behind the rabbet section. When the frame is grounded in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.

2.03 LOCKSETS, LATCH SETS:

A. Mortise Locksets and Latch sets: as scheduled.
   1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
   2. Latch Bolts: 3/4 inch throw stainless steel anti-friction type.
   3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
      a. Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hub works to gain wrongful entry.
      b. Inside lever applied by screwless shank mounting — no exposed trim mount screws.
      c. Outside and inside trim thru-bolted together and through the door.
   4. Spring-loaded fusible link provides full secure mode in case of fire.
   5. Universal lock case — 10 functions in one case.
   6. Floating mounting tabs automatically adjusts to fit a beveled door edge.
   7. Field reversible handing without opening lock case.
   8. External spring cages allow for simple trim retrofit.
   9. Lever rotation in both directions (up & down) for ease of use.
   10. Independent lever rotation.
   11. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
   12. Thumb turns: accessible design not requiring pinching or twisting motions to operate.

13. Strikes: 16 GA curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
14. Lock Series and Design: as scheduled.
15. Certifications:
    a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
    b. ANSI/ASTM F476-84 Grade 31 UL Listed.

2.04 EXIT DEVICES / PANIC HARDWARE

A. General features: Shall be Von Duprin, series as scheduled on Hardware Sets.
   1. Independent lab-tested 1,000,000 cycles.
   2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
   3. 0.75-inch throw deadlocking latch bolts.
   4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
   5. No exposed screws to show through glass doors.
   6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
   7. Releasable in normal operation with 15-lb. maximum operating force per California State Fire Marshal Standard 12-10-3, and with 32 lb. maximum pressure under 250-lb. load to the door.
   8. Where devices span over door lite frame and the face of the selected lite manufacturer's frame is raised from the face of the door, furnish panic hardware manufacturer's fitted shims or glass-bead kits at no additional cost to the project.
   9. Comply with CBC Section 1003.3.1.9.
B. Specific features:
   1. Non-Fire Rated Devices: cylinder dogging.
   2. Lever Trim: breakaway type, forged brass or bronze escutcheon min.130" thickness, compression spring drive, match lockset lever design.
   3. Fire-Labeled Devices: UL label indicating 'Fire Exit Hardware'. Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.

2.05 REMOVABLE MULLIONS

A. Removable with single turn of building key. Securely reinstall without need for key.
B. Furnish storage brackets for securely stowing the mullion away from the door when the mullion is removed.

2.06 CLOSERS

A. Surface Closers:
   1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast-iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
   2. ISO 2000 certified. Units stamped with date-of-manufacture code.
   3. Independent lab-tested 10,000,000 cycles.
   4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
   5. Plates, brackets and special templating when needed for interface with a particular header, door and wall conditions and neighboring hardware.
   6. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per California Building Code, Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15lbs.

7. Door closers and gate closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.
8. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
9. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
10. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
11. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
12. Non-flaming fluid, will not fuel door or floor covering fires.
13. Pressure Relief Valves (PRV) not permitted.

2.07 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design.
B. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
C. Kick Plates: Rounded and relieved edges, .050" minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
D. Door Stops: Provide stops to protect walls, casework or other hardware.
   1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
   2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg dead stop. Note degree of opening in submittal.
E. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.
   1. Proposed substitutions: submit for approval.
   2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.
   3. Non-corroding fasteners at in-swinging exterior doors.
   4. Sound control openings: Use components tested as a system using nationally accepted standards by independent laboratories. Ensure that the door leafs have the necessary sealed-in-place STC ratings. Fasten applied seals over bead of sealant.
   5. Fire-rated Doors, Resilient Seals: UL10C / UBC Standard 7-2 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.
   6. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C / UBC Standard 7-2. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required
F. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.
G. Thresholds: As scheduled and per details. Comply with CBC Section 11B-303. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
   1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 'Thermal and Moisture Protection'. Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head ffSFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

2. Flat saddle type thresholds shall have a minimum wall thickness of .125".
3. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.
4. Acoustic openings: Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.
5. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
6. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

H. Exposed Through-Bolts: Do not use SNB, grommet nuts, sleeve nuts or other such clamping type fasteners, intent is for minimal exposed hardware. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.
1. Silencers: Interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.8 FINISH:

A. Generally, BHMA 626 Satin Chromium.
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.9 KEYING REQUIREMENTS:

A. Key System: (Exterior) Schlage Everest 'D' Primus high-security and (Interior) Schlage Everest 'D' keyways, interchangeable core throughout. Utility patent protection. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers.
1. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
2. Temporary cylinders/cores remain supplier's property.
3. Furnish 20 construction keys.
4. Furnish 2 construction control keys.
5. Key Cylinders: furnish 6-pin solid brass construction.
6. Furnish 100 key blanks, and 20 extra IC cores '0' bitted.

B. Permanent Cores: keyed by Los Alamitos USD locksmith. Provide permanent cores as '0' bitted with keys. Locksets and cylinders same manufacturer.

C. Permanent keys: use secured shipment direct from point of origination to Owners agent
1. For estimate: 3 keys per change combination, 3 control keys.
2. For estimate: VKC stamping plus 'Do Not Duplicate'.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS:

A. Can read and understand manufacturers' templates, suppliers' hardware schedules and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.02 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.
B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
   1. Notify Architect of any code or other conflicts before ordering material.
   2. Locate levers, key cylinders, I-turn pieces, touchbars and other operable portions of latching hardware between 34 inches to 44 inches above the finished floor, per CBC Section 11B-404.2.7.
   3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.
C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.03 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
   1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
   2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
   3. Use manufacturers' fasteners furnished with hardware items, or submit ‘Request for Substitution’ to Architect.
   4. Replace fasteners damaged by power-driven tools.
B. Locate floor stops no more than 4" from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.
D. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.
E. Drill pilot holes for fasteners in wood doors and/or frames. Centerpunch hole locations before using self-drilling type screws to prevent skating. Replace screws that are not centered in their holes.
F. Field verify existing conditions and measurements prior to ordering hardware.
G. Provide proper brackets to accommodate the mounting of closers on doors with flush transoms.

3.04 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
   1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner’s satisfaction.
   2. Adjust doors to fully latch with no more than 1 pound of pressure.
   3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
   4. Adjust door closers per 1.9 this section.
B. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:
   1. Re-adjust hardware.
   2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner’s personnel.

3. Identify items that have deteriorated or failed.
4. Submit written report identifying problems.

3.05 DEMONSTRATION:

A. Demonstrate mechanical hardware systems, including adjustment and maintenance procedures.

3.06 PROTECTION /CLEANING:

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.07 SCHEDULE OF FINISH HARDWARE:

A. See door schedule in drawings for hardware set assignments.
B. Manufacturers and their abbreviations used in this schedule:
1. By Others
2. Glynn-Johnson
3. Hager Companies
4. H.B. Ives
5. LCN Closers
6. Markar Architectural Products, Inc.
7. Pemko Manufacturing
8. Specialized Builder's Hardware
9. Schlage Lock Company

DOOR HARDWARE

HARDWARE GROUP NO. 01

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONTINUOUS HINGE	CFM83HD1-PT	628	PEM
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-AX-99-EO	626	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-AX-99-NL-OP-110MD	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX 36-083	626	SCH
2	EA	PRIMUS CORE	20-740	626	SCH
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP HCUSH	689	LCN
1	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	DRIP CAP	346C	AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
2	EA	DOOR SWEEP	18062CNB	AL	PEM
4	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
2	EA	MULTITECH READER	MTB15 PROVIDED BY DIVSION 28	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS 900-BBK 120/240 VAC		VON

AD-300 TRIM IS SHOWN FOR TEMPLATING PURPOSE ONLY

AD-300 TRIM TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR
POWER SUPPLY TO BE SUPPLIED AND INSTALLED BY DIVISION 28
OPENING TO HAVE FREE EGRESS AT ALL TIMES
INTERIOR CARD READER TO BE USED FOR LOCAL LOCK DOWN OF OPENING IF REQUIRED
ACCESS CONTROL SYSTEM TO ENGAGE ELECTRIC LATCH RETRACTION DURING OPERATING HOURS
DURING OPERATING HOURS DOORS TO OPERATE AS PUSH PULL
EXTERIOR CARD READER FOR USE FOR AFTER HOURS ENTRY
BOTH DOORS HAVE HOLD OPEN FEATURE IN CLOSER ARM

HARDWARE GROUP NO. 02

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC OFFICE LOCK	AD-300-MS-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR

HARDWARE GROUP NO. 03

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	CFM83HD1-PT	628	PEM
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC OFFICE LOCK	AD-300-MS-50-MT-RHO-J 12/24 VDC	626	SCE
2	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	CLOSER MOUNTING BRACKET	BKT075	GRY	PEM
1	EA	KICK PLATE	8400 10” X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DRIP CAP	346C	AL	PEM
1	EA	SEALS	303AS HEAD X JAMBS	AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
1	EA	DOOR SWEEP	18062CNB	AL	PEM
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR

HARDWARE GROUP NO. 04

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	L9040 06A L583-363 L283-722	630	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 05

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	652	. IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC OFFICE LOCK	AD-300-MS-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

HARDWARE GROUP NO. 6

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	CHS83HD1 (WITH SECURITY SCREWS TO SECURE COVER)	628	PEM
1	EA	CLASSROOM DEAD LOCK	L463T	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	DRIP CAP	346C	AL	PEM
1	EA	SEALS	303AS HEAD X JAMBS	AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
1	EA	DOOR SWEEP	18062CNB	AL	PEM

HARDWARE GROUP NO. 07

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	CHS83HD1 (WITH SECURITY SCREWS TO SECURE COVER)	628	PEM
1	EA	PRIVACY W/DB & IND	L9496P6 06A L583-363 XL11-986	630	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	DRIP CAP	346C	AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
1	EA	DOOR SWEEP	18062CNB	AL	PEM
3	EA	SILENCER	SR64	GRY	IVE
1			POWER SUPPLY - WORK OF DIVISION 28		

OPENING TO HAVE FREE EGRESS AT ALL TIMES
OPENING CAN BE SECURED BY ACCESS CONTROL SYSTEM FOR AFTER HOURS SECURITY

HARDWARE GROUP NO. 08

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELEC OFFICE LOCK	AD-300-MS-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	ASTRAGAL	357SP X S44D	600	PEM
1	EA	THRESHOLD	545A	A	ZER
2	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

THRESHOLD TO ONLY BE FASTENED ON HALLWAY/TEAM ROOM SIDE TO ALLOW GYM FLOOR TO FLOAT, CONFIRM WITH ARCHITECT ON FASTENING DETAIL
AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR

HARDWARE GROUP NO. 09

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	LD-RX-PA-AX-99-EO	626	VON
1	EA	ELEC EXIT DEVICE TRIM	AD-300-993R-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	MORTISE CYLINDER	20-061 ICX 36-083	626	SCH
2	EA	PRIMUS CORE	20-740	626	SCH
2	EA	SURFACE CLOSER	4040XP HCUSH	689	LCN
1	EA	THRESHOLD	545A	A	ZER
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

THRESHOLD TO ONLY BE FASTENED ON HALLWAY SIDE TO ALLOW GYM FLOOR TO FLOAT, CONFIRM WITH ARCHITECT ON FASTENING DETAIL
AD-300 TRIM IS SHOWN FOR TEMPLATING PURPOSE ONLY
AD-300 TRIM TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR
OPENING TO HAVE FREE EGRESS AT ALL TIMES
ONE DOOR AT PAIR TO HAVE ACCESS CONTROL TRIM
ACCESS CONTROL SYSTEM TO ENGAGE ACCESS CONTROL TRIM DURING OPERATING HOURS DURING OPERATING HOURS ENTRY IS ACCOMPLISHED WITH USE OF LEVER AT ACTIVE DOOR INACTIVE DOOR IS EXIT ONLY
BOTH DOORS HAVE HOLD OPEN FEATURE IN CLOSER ARM

HARDWARE GROUP NO. 10

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELEC CLASSROOM LOCK	AD-300-MS-70-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP H	689	LCN
1	EA	ASTRAGAL	357SP X S44D	600	PEM
1	EA	THRESHOLD	545A	A	ZER
2	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH

THRESHOLD TO ONLY BE FASTENED ON STOREROOM SIDE TO ALLOW GYM FLOOR TO FLOAT, CONFIRM WITH ARCHITECT ON FASTENING DETAIL

AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR
BOTH DOORS HAVE HOLD OPEN FEATURE IN CLOSER ARM

HARDWARE GROUP NO. 11

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONTINUOUS HINGE	CFM83HD1-PT	628	PEM
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	ELEC PANIC HARDWARE	LD-RX-PA-AX-99-EO	626	VON
1	EA	ELEC EXIT DEVICE TRIM	AD-300-993R-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	MORTISE CYLINDER	20-061 ICX 36-083	626	SCH
2	EA	PRIMUS CORE	20-740	626	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	DRIP CAP	346C	AL	PEM
2	EA	DOOR SWEEP	18062CNB	AL	PEM
1	EA	THRESHOLD RISER	437	AL	REE
1	EA	THRESHOLD	601CPA-NH PER DETAILS	A	ZER
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

AD-300 TRIM IS SHOWN FOR TEMPLATING PURPOSE ONLY
AD-300 TRIM TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR OPENING
TO HAVE FREE EGRESS AT ALL TIMES
ONE DOOR AT PAIR TO HAVE ACCESS CONTROL TRIM
ACCESS CONTROL SYSTEM TO ENGAGE ACCESS CONTROL TRIM DURING OPERATING HOURS DURING OPERATING HOURS ENTRY IS ACCOMPLISHED WITH USE OF LEVER AT ACTIVE DOOR INACTIVE DOOR IS EXIT ONLY

HARDWARE GROUP NO. 12

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELEC OFFICE LOCK	AD-300-MS-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	ASTRAGAL	357SP X S44D	600	PEM
1	EA	THRESHOLD	545A	A	ZER

2	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH
1			POWER SUPPLY - WORK OF DIVISION 28		

THRESHOLD TO ONLY BE FASTENED ON WEIGHTROOM SIDE TO ALLOW GYM FLOOR TO FLOAT, CONFIRM WITH ARCHITECT ON FASTENING DETAIL
AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR

HARDWARE GROUP NO. 13

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	CHS83HD1 (WITH SECURITY SCREWS TO SECURE COVER)	628	PEM
1	EA	PANIC HARDWARE	LD-PA-AX-99-NL-OP-110MD	626	VON
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DRIP CAP	346C	AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
1	EA	DOOR SWEEP	18062CNB	AL	PEM
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 14

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	CFM83HD1	628	PEM
2	EA	CONTINUOUS HINGE	CFM83HD1-PT	628	PEM
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ELEC CLASSROOM LOCK	AD-300-MS-70-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
1	EA	ASTRAGAL	357SP X S44D	600	PEM
2	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH

AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR BOTH DOORS HAVE HOLD OPEN FEATURE IN CLOSER ARM

HARDWARE GROUP NO. 15

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	MORTISE CYLINDER	20-061 ICX 36-083	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH

ALL OTHER HARDWARE BY DOOR MANUFACTURER
VERIFY CORRECT CYLINDER REQUIREMENT

HARDWARE GROUP NO. 16

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC CLASSROOM LOCK	AD-300-MS-70-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
2	EA	WIRE HARNESS	CON X LENGTH AS REQ'D		SCH

AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR

HARDWARE GROUP NO. 17

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	PANIC HARDWARE	LD-PA-AX-99-EO	626	VON
1	EA	ELEC EXIT DEVICE TRIM	AD-300-993R-50-MT-RHO-J 12/24 VDC	626	SCE
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1			POWER SUPPLY - WORK OF DIVISION 28		

AD-300 TRIM IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 TRIM TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR
OPENING TO HAVE FREE EGRESS AT ALL TIMES
ACCESS CONTROL SYSTEM TO ENGAGE ACCESS CONTROL TRIM DURING OPERATING HOURS
DURING OPERATING HOURS ENTRY IS ACCOMPLISHED WITH USE OF LEVER

HARDWARE GROUP NO. 18

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	CFM83HD1-PT		628	PEM
1	EA	POWER TRANSFER	EPT10	4	689	VON
1	EA	PANIC HARDWARE	PA-AX-99-EO		626	VON
1	EA	ELEC EXIT DEVICE TRIM	AD-300-993R-50-MT-RHO-J 12/24 VDC		626	SCE
1	EA	PRIMUS CORE	20-740		626	SCH
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2“ LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18S		BLK	IVE
1	EA	DRIP CAP	346C		AL	PEM
1	EA	SEALS	303AS HEAD X JAMBS		AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS			
1	EA	DOOR SWEEP	18062CNB		AL	PEM
1			POWER SUPPLY - WORK OF DIVISION 28			

AD-300 TRIM IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 TRIM TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR
OPENING TO HAVE FREE EGRESS AT ALL TIMES
ACCESS CONTROL SYSTEM TO ENGAGE ACCESS CONTROL TRIM DURING OPERATING HOURS
DURING OPERATING HOURS ENTRY IS ACCOMPLISHED WITH USE OF LEVER

HARDWARE GROUP NO. 19

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	ACCESSIBLE STOREROOM LOCK	L9081T 06A	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 20

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	CHS83HD1 (WITH SECURITY SCREWS TO SECURE COVER)	628	PEM
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
2	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	CLOSER MOUNTING BRACKET	BKT075	GRY	PEM

1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DRIP CAP	346C	AL	PEM
1	EA	SEALS	303AS HEAD X JAMBS	AL	PEM
1	EA	THRESHOLD	AS REQUIRED PER CONDITIONS		
1	EA	DOOR SWEEP	18062CNB	AL	PEM

AD LOCK IS SHOWN FOR TEMPLATING PURPOSES ONLY,
AD-300 LOCK TO SUPPLIED AND INSTALLED BY DIVISION 28 CONTRACTOR

HARDWARE GROUP NO. 21

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	' 689	VON
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	L9070T 06A	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	ASTRAGAL	357SP X S44D	600	PEM
1	EA	THRESHOLD	545A	A	ZER
2	EA	SILENCER	SR64	GRY	IVE
1			POWER SUPPLY - WORK OF DIVISION 28		

THRESHOLD TO ONLY BE FASTENED ON HALLWAY/TEAM ROOM SIDE TO ALLOW GYM FLOOR TO FLOAT, CONFIRM WITH ARCHITECT ON FASTENING DETAIL

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass and glazing for doors and framed openings.

1.02 RELATED SECTIONS

A. Section 07 92 00 - Sealants and Caulking.

B. Section 08 41 10 - Aluminum Framed Storefront

C. Section 08 56 59 - Transaction Window

D. Section 08 87 13 - Safety and Security Window Film

1.03 REFERENCES

A. AAMA 605.2 American Architectural Manufacturers Association; Voluntary Specification for High Performance Organic Coatings.

B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

C. ASTM C669 - Glazing Compounds for Back Bedding and Face Glazing of Metal Sash.

D. ASTM C1193 - Use of Joint Sealants.

E. ASTM C864 - Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

F. ASTM C920 - Elastomeric Joint Sealants.

G. ASTM C1036 - Standard Specification for Flat Glass.

H. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass.

I. ASTM E84 - Surface Burning Characteristics of Building Materials.

J. ASTM E283 - Test Method For Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.

K. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

L. CPSC 16 CFR 1201- Consumer Products Safety Commission Safety Standards for Architectural Glazing Materials.

M. FGMA - Flat Glass Marketing Association Glazing Manual.

N. N. FGMA - Flat Glass Marketing Association Sealant Manual.

O. T24, CCR - Title 24, California Code of Regulations, Chapter 24.

1.04 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less, when tested in accordance with ASTM E330.

1.05 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.

C. Product Data on Accessories: Submit manufacturers descriptive information and installation instructions for all glazing accessories required for installation according to this section and other sections referencing this section.

D. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, and special application requirements.

E. Product Data on Opaque Glazing Panels: Submit manufacturers descriptive literature and installation instructions; indicate thickness and dimensions of parts, and fastening and anchoring methods.

F. Samples: Submit three samples 4 x 4 inch in size, for each type of glass or glazing panel. Grind and radius edges. Identify each unit with an indelibly marked label.

G. Color Samples for Opaque Glazing Panels: Submit two color selectors with full range of colors available; Samples shall be of specified material, and not a reproduction.

H. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual

B. Conform to T24, CCR.

C. Label each piece of glazing material with manufacturers name and grade or quality of material. Labels shall be intact before and after installation.

1.07 QUALIFICATIONS

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.08 1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver glass, opaque panels, and glazing materials with manufacturers labels intact.

B. Protect glass and opaque panels from discoloration, marking, or damage.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

C. Perform glazing on clean, dry surfaces only.

1.10 WARRANTY

A. Provide five (5) year Contractor's warranty under provisions of Section 01 70 00 for integrity of glazing system. Warranty to include all failures of system to prevent infiltration of air or water in excess of specified allowances.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Viracon - Basis of Design

B. PPG

C. Libbey Owens Ford

D. Substitutions: Refer to Section 01 63 00 - Product Substitution Procedures.

2.02 EXTERIOR INSULATED VISION GLAZING

A. 1" VRE35-4322/clear Insulating HS/HS
   1. Outer Lite: ¼" Pure Mid Iron with VRE35-43 on #2 surface
   2. Space: 1/2" airspace - aluminum, black painted, air filled
   3. Interior Lite: ¼" Clear HS

B. Performance Requirements
   1. Visible Light Transmittance: 44%
   2. Solar Energy Transmittance: 18%
   3. Ultra-Violet Transmittance: 8%
   4. Exterior - Visible Light Reflectance: 26%

5. Interior - Visible Light Reflectance: 19%
6. Solar Energy Reflectance: 48%
7. Winter U-Value: 0.29
8. Summer U-Value: 0.26
9. Shading Coefficient: 0.25
10. Solar Heat Gain Coefficient: 0.22
11. Relative Heat Gain: 54 Btu/hr x sqft

2.03 SAFETY AND SECURITY FILM

A. Requirements: Under provisions of Section 08 87 23 - Safety and Security Window Films

2.04 GLAZING ACCESSORIES

A. Setting Blocks: ASTM C864, Option I; Neoprene 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: ASTM C864, Option I; Neoprene 50 to 60 Shore A durometer hardness, minimum 3 inch long x one half the height of the glazing stop x thickness to suit application.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Gaskets: ASTM C864 Option I, Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; color as selected by Architect.

E. Glazing Clips: Manufacturer's standard type.

2.05 SOURCE QUALITY CONTROL AND TESTS

A. Provide testing and analysis of glass to Section 01 40 00.

B. Test samples for compliance with ANSI Z97.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items to be glazed under provisions of Section 01 03 90.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

3.03 ACCESSIBILITY

A. Where glazed openings are provided in accessible rooms or spaces for operation by occupants, at least one shall comply with CBC Section 11B-309.

B. Pass-through windows:
   1. Pass-through windows of sales/service counter shall comply with the reach and access requirements of CBC Sections 11B-227.3, 11B-305, 11B-306, 11B-308, 11B-309 and 11B-904.4

3.04 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 below sight line. Place glazing tape on glazing pane with tape flush with sight line.

F. Fill gap between glazing and stop with butyl sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

G. Apply cap bead of butyl sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.05 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install 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 to ensure full contact at perimeter of pane.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. E. Fill gaps between pane and applied stop with butyl sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.06 INSTALLATION - BUTT GLAZED METHOD

A. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges between glass edges and framing members.

B. Temporarily secure a small diameter non-adhering foam rod on back side of joint.

C. Apply silicone sealant to the open side of joint in continuous operation; thoroughly fill the joint without displacing the foam rod. Tool the sealant surface smooth to concave profile.

D. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.

E. Remove masking tape.

3.07 INSTALLATION - GENERAL

A. Double Strength Glass shall meet the following schedule of thicknesses:
   1. Maximum Areas in Square Feet for Thickness of Glass:
      a. Up to 12 sq ft for 1/8 inch glass.
      b. Up to 16 sq ft for 3/16 inch glass.
      c. Up to 20 sq ft for 1/4 inch glass.

B. Glazed cabinet doors shall be glazed with "Clear Sheet Glass," unless otherwise noted or indicated.

C. Install safety-rated glass (tempered glass, tinted tempered glass, obscure tempered glass, or fire-rated glass) in all door lights and window openings.

D. Obscure glass in exterior openings shall be placed with smooth side of glass to weather. Patterned glass shall have pattern running vertically, unless directed otherwise.

E. Speak holes shall be cut according to glass manufacturer's recommendations, and as approved by the Architect.

F. Install opaque glazing panels where indicated in plans, on door and window schedules, or on door and window types.

3.08 CLEANING

A. Perform cleaning immediately after completion of glazing, and final cleaning in accordance with Section 01700.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is complete.

D. Clean glass, opaque panels, and adjacent surfaces.

3.09 PROTECTION OF FINISHED WORK

A. Protect work in accordance with Section 01 70 00

B. After installation, mark translucent panes with an 'X' by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

C. Glazing damaged or broken prior to final acceptance shall be replaced at no additional expense to Owner.

END OF SECTION

SECTION 08 87 23
SAFETY AND SECURITY WINDOW FILMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing film applied to new glazing assemblies.

1.02 RELATED REQUIREMENTS

A. Section 08 41 10 - Aluminum Framed Storefront

B. Section 08 80 00 - Glazing

1.03 REFERENCE STANDARDS

A. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting 2018.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

C. Specimen Warranty.

1.05 QUALITY ASSURANCE

1.06 FIELD 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.

1.07 WARRANTY

A. Provide 15 year limited product warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 3M Safety and Security Window Film; Ultra S600: www.solutions.3m.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SAFETY AND SECURITY GLAZING FILM

A. Description: Multilayer constructed, shatter resistant and abrasion resistant film designed to be adhesively applied to the interior glass surface of the window assembly.

B. Impact Resistance for Safety Glazing: The film, when applied to either side of the window glass, shall pass a 400 ft-lb impact when tested according to 16 CFR CPSC Part 1201 (Category 2) and ANSI Z97.1 (Class A, Unlimited) and shall pass the accelerated weathering test requirements for both tensile strength and peel strength.

C. Bomb Blast Mitigation:
   1. GSA Rating of “3A” (Very Low Hazard) with minimum blast load of 11 psi overpressure and 55 psi*msec blast impulse.
   2. GSA Rating of “3B” (Low Hazard) with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse.

2.03 MATERIALS

A. Glazing Film:
   1. Thickness: 0.0059 inch, minimum.
   2. Color: Optically Clear.
   3. Adhesive Type: Pressure sensitive acrylic.
   4. Tensile Strength: 30,000 psi minimum when tested in accordance with ASTM D882.

5. Breaking Strength: 30,000 psi when tested in accordance with ASTM D882.
6. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).
7. Light Transmission of Film Applied on 1/4 inch Thick Clear Annealed Glass:
    a. Visible Light Transmittance: 73 percent.
    b. Visible Light Reflecttance: 18 percent
    c. Glare Reduction: 8 percent
    d. Heat Loss Reduction: 0 percent
    e. Solar Energy:
        1) 0.68 solar heat gain coefficient
        2) 0.47 U Value
        3) 99 percent UV Block
        4) 3 percent Solar Heat Reduction

B. Adhesive System: The film shall be supplied with a high mass pressure sensitive weatherable acrylate adhesive applied uniformly over the surface opposite the abrasion resistant coated surface. The adhesive shall be essentially optically flat and shall meet the following criteria:
    1. Viewing the film from a distance of ten feet at angles up to 45 degrees from either side of the glass, the film itself shall not appear distorted.
    2. It shall not be necessary to seal around the edges of the applied film system with a lacquer or other substance in order to prevent moisture or free water from penetrating under the film system.

C. Accessory Materials: As recommended or required by film manufacturer.

D. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.

B. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.

C. Verify glass is not cracked, chipped, broken, or damaged.

D. Verify that frames are securely anchored and free of defects.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.03 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.

D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

F. Remove labels and protective covers.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile flooring
   2. Wood athletic flooring
   3. Rubber flooring

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Patching compound.

F. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete 2020.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2022.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.

1.04 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.
   2. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   3. Manufacturer's installation instructions.
   4. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.

5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Certificate: Include certification of accuracy by authorized official of testing agency.
8. Submit report to Architect.
9. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
2. Use product recommended by testing agency.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.
   9. Protection.

3.02 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.03 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.06 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.07 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 22 36
METAL LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lath for Portland cement plaster.

B. Metal lath accessories

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Sheathing on exterior walls.

B. Section 07 27 26 - Gypsum Air and Vapor Barrier Sheathing System.

C. Section 08 31 00 - Access Doors and Panels: Product requirements for metal access panels integral with metal lath.

D. Section 09 24 00 - Cement Plastering.

E. Section 09 24 00 - Portland Cement Plaster

1.03 REFERENCE STANDARDS

A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring 2023.

B. ASTM C847 - Standard Specification for Metal Lath 2018.

C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2022.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.

E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster 2022a.

F. NAAMM ML/SFA 920 - Guide Specifications For Metal Lathing and Furring; The National Association of Architectural Metal Manufacturers; 2009.

1.04 SUBMITTALS

A. See section 01 33 00 - Submittal Procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lath Basis of Design:
   1. Struct Wire Corporation www.structawire.com
      a. Product: MegaLath

B. Acceptable manufacturers subject to providing comparable products:
   1. CEMCO: www.cemcosteel.com/#sle.
   2. ClarkDietrich: www.clarkdietrich.com/#sle.
   3. Semco Southeastern Metals: www.semetals.com/#sle.

2.02 LATH

A. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
   1. Weight: To suit application and as specified in ASTM C841 for framing spacing.
   2. Weight: 2.5 lb/sq yd.
   3. Backed with treated paper.

B. Corner Mesh: ASTM C1063; Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.

C. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.

D. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.
   1. Material: Formed zinc, expanded metal flanges.
   2. Casing Beads with Weep Holes: Square edges.

2.03 ACCESSORIES

A. Access Panels: See Section 08 31 00.

B. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.

C. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.

D. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly; see Section 07 25 00.

D. Do not begin until unacceptable conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

3.03 CONTROL JOINTS

A. Locate joints as indicated on drawings and comply with ASTM C1063.
   1. Area of plaster panel not to exceed 144 sq ft for vertical surfaces.
   2. Area of plaster panel not to exceed 100 sq ft for horizontal, curved or angled surfaces.
   3. Spacing between control joints not to exceed 18 ft in each direction.
   4. Area bounded by control joints not to exceed a length-to-width ratio of 2-1/2 to 1.

3.04 ACCESS PANELS INSTALLATION

A. Install access panels and rigidly secure in place.

B. Install frames plumb and level in opening. Secure rigidly in place.

C. Position to provide convenient access to concealed work requiring access.

3.05 LATH INSTALLATION

A. Apply lath taut, with long dimension perpendicular to supports.

B. Attach metal lath to metal supports using tie wire at maximum 6 inches on center.

C. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

D. Place corner bead at external wall corners; fasten at outer edges of lath only.

E. Place base screeds at termination of plaster areas; secure rigidly in place.

F. Place 4 inch wide strips of lath centered over junctions of dissimilar backing materials, and secure rigidly in place.

G. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

H. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

I. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.06 TOLERANCES

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 24 00
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Portland Cement plastering.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Structural metal framing for plaster.

B. Section 09 22 36 - Metal Lath: Lath, beads, screeds, and joint accessories for plaster base.

C. Section 09 90 00 - Painting and Coating

1.03 REFERENCE STANDARDS

A. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster 2023.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittal Proceedures

B. Product Data: Provide data on plaster materials and trim accessories.

C. Samples:
   1. Submit two samples, 24 by 24 inch in size illustrating:
      a.
      b. Finish color and texture.
      c. Reveal: Vertical, horizontal, and intersection

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

A. Lath Plaster Base: Metal lath.
   1. Plaster Type: Factory prepared plaster mix.
   2. Number of Coats: Three.
   3. First Coat: Apply to a nominal thickness of 3/8 inch.
   4. Second Coat: Apply to a nominal thickness of 3/8 inch.
   5. Finish Coat: Apply to a nominal thickness of 1/8 inch.
      a. Texture: Light Dash.

2.02 FACTORY PREPARED CEMENT PLASTER

A. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
   1. Manufacturer
      a. LaHabra: www.lahabrastucco.com
      b. Omega: www.omega-products.com
      c. Parex USA, Inc; Armourwall 300: www.parexusa.com/#sle.

2.03 ACCESSORIES

A. Lath: See Section 09 22 36.

B. Reinforcing Mesh: 4.0 oz/sq yd alkali-resistant woven glass fiber mesh.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

3.02 MIXING

A. Mix only as much plaster as can be used prior to initial set.

B. Mix materials dry, to uniform color and consistency, before adding water.

C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.03 APPLICATION

A. Apply plaster in accordance with manufacturer's written instructions.

B. Base Coats:
   1. Apply base coat(s) to fully embed lath and to specified thickness.
   2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.

C. Finish Coats:
   1. Cement Plaster:
      a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.
      b. Apply desired surface texture while mix is still workable.
      c. Spray to a consistent finish.

3.04 TOLERANCES

A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.05 REPAIR

A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD ASSEMBLY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustic insulation.

B. Gypsum wallboard.

C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 07 27 26 - Gypsum Air and Vapor Barrier Sheathing System: Cement Board

C. Section 09 22 10 - Non-Structural Metal Framing.

D. Section 09 30 00 - Tiling

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2018.

E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittals for submittal proceedures.

B. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

C. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 BOARD MATERIALS

A. Manufacturers
   1. National Gypsum Company; Bases of Design: www.nationalgypsum.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com.
   3. USG Corporation: www.usg.com.
   4. Or Approved Equal.

B. Board Products
   1. General
      a. All gypsum board products shall be:
         1) Mildew and mold resistant, with a score of 10 on ASTM D3273.
         2) water resistant
         3) 5/8-inch thick, unless noted otherwise.
         4) Type X

2. Impact Resistant Gypsum Board
    a. Product: Gold Bond - XP Hi-Impact Gypsum Board
    b. Panel Physical Characteristics:
        1) Core: Enhanced Mold Moisture-Resistant Type X Core with Embedded fiberglass mesh Reinforcement.
        2) Face and Back Paper: Heavy Abrasion/Mold and Moisture-Resistant.
        3) ASTM D4977 Surface Abrasion Classification Level 3.
        4) ASTM D5420 Surface Indentation Classification Level 1.
        5) ASTM E695 Soft-Body Impact Classification Level 3.
        6) Annex A1 Hard-Body Impact Classification Level 3.
3. Mold and Mildew Resistant Tile Backer
    a. Product: Gold Bond eXP Tile Backer
    b. Panel Physical Characteristics:
        1) Core: Mold and moisture resistant gypsum core.
        2) Surface: Fiberglass Mat; moisture resistant, acrylic coated water barrier onfront.
        3) Water Absorption: less than 5% when tested in accordance with ASTMC473.
        4) Combustibility: Noncombustible when tested in accordance with ASTM E136.
        5) Flame spreads/smoke Developed: 0/0 when tested in accordance with ASTM E84.
        6) Provide low emitting material compling with the requirements of ASTM C 1178.
4. Gypsum Board
    a. Product: Gold Bond XP Gypsum Board
    b. Panel Physical Characteristics:
        1) Core: Enhanced Mold Moisture-Resistant
        2) Face Paper: Mold and Moisture-Resistant.
        3) ASTM E84 Surface Burning Characteristics:
            (a) Flame spread: 15
            (b) Smoke Development: 0
        4) Panel complies with requirements of ASTM C 1396

2.02 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: Meeting ASTM C665; preformed glass fiber, friction fit type, unfaced.
    1. Thickness: Full depth of wall stud.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
    1. Products:
        a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
        b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
        c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
    2. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
        a. Corner Beads: Low profile, for 90 degree outside corners.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

D. Fasteners: ASTM C1002, United States Gypsum type S, S12, W, G, and Durock cement board screws, or approved equal, as recommended by manufacturer; corrosion resistant; sizes as recommended by manufacturer or as indicated.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SOUND INSULATED PARTITIONS

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place continuous bead at perimeter of each layer of gypsum board.
   2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.03 BOARD INSTALLATION

A. General
   1. Installation on Metal Framing: Use screws for attachment of gypsum board.
   2. Install using largest pieces possible.

B. Abuse Resistant Gypsum Board Installation
   1. Install in accordance with manufacturer recommendations, ASTM C840 andGA-216

C. Tile Backer Gypsum Board Installation
   1. General
      a. Install in accordance with manufacturer recommendations, ASTM C840 and GA-216
      b. Install with acrylic coated water barrier side facing away from the framing, so that finishes shall be applied to the coated side.
      c. Caulk or seal penetrations and abutments to dissimilar materials.
   2. For Walls
      a. Install panels horizontal or vertical to supports spaced a maximum of 16-inches on center.
      b. Space fasteners 8-inches on center along all support members. Drive fasteners flush with the panel surface, do not countersink.
   3. For Ceilings
      a. Install panels perpendicular to supports spaced a maximum of 12-inches oncenter for 1/2-inch thick panels and 16 inches on center for 5/8-inch thick panels.
      b. Space fasteners 8 inches on center along all support members. Drive fasteners flush with the panel surface, do not countersink.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes as follows:
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Fill all corners and recesses between boards with sufficient thickness of joint compound to completely hide board at all joints. Center tape on joint and press tightly to 2 panels using suitable tool. Lay excess joint compound squeezed from beneath tape smoothly on top of tape.
   3. When first coat is dry, spread a second coat of joint compound evenly over entire joint to beyond tapered edge of board or edge of t a p e.

4. When second coat is dry, apply sufficient joint compound to level all surfaces of joint.
5. Apply at least 2 coats of joint compound to completely fill screw depressions flush with surface of panel. Treat all other depressions in panel surface as required for screws.
6. At metal trim, apply 3 full coats ofjoint compound, feathering away from flanges. At corner beads, applyjoint compound full thickness at bead and feather out at least 10 inches.
7. Between coats of joint compound, rough spots or areas shall be sanded smooth.
8. When dry, the finish coat shall be sanded as required to leave joints and filled depressions flat, flush, and smooth, ready for finishing.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.07 GYPSUM BOARD TYPE - SCHEDULE

BOARD TYPE	**LOCATION**
Impact Resistant Gypsum Board	Room 113 Gymnasium
	Room 126 Weight Room
Mold and Mildew Resistant Tile Backer	Room 101 Concessions
	Room 123 Janitor
	All Restrooms
XP Gypsum Board	All walls and ceilings unless noted otherwise

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for wall and base applications.

B. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold Formed Metal Framing.

B. Section 07 92 00 - Joint Sealants and Caulking.

C. Section 09 29 00 - Gypsum Board Assemblies; For cementitious backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 1999 (Reaffirmed 2021).

B. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.

C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.

D. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2019.

E. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 2019.

F. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2022.

G. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2021.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, and control and expansion joints.

D. Samples: Submit three sets for each type of tile and grout.

E. Installer's Qualification Statement:
   1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. 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 Tile: 10 square feet of each size, color, and surface finish combination.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers:
   1. Dal-Tile Corporation: www.daltile.com/#sle.
   2. Arizona Tile: www.arizonatile.com.
   3. Substitutions: See Section 01 63 00 - Product Substitution Proceedures

B. Glazed Wall Tile:
   1. Product: As scheduled on Drawings
   2. Sizes: As scheduled on drawings
   3. Colors: As scheduled on Drawings
   4. Pattern: As scheduled on Drawings

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose and cove base ceramic shapes in sizes indicated.
   1. Manufacturers: Same as for tile.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. Custom Building Products: www.custombuildingproducts.com/#sle.
   2. LATICRETE International, Inc: www.laticrete.com/#sle.
   3. Or Approved Equal.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
   1. Modified Dry-Set Cement Mortars: as required for setting tile as specified by ANSI A108.5, Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar, over substrates prepared accordingly.
      a. For Installing Large Format Ceramic Tile (Tile with one edge greater than 15 inches), utilizing a Medium bed Mortar System.
         1) Custom Building Products; ProLite Premium Large Format Tile Mortar With Shear Bond Strengths greater than 400 psi, per ANSI A118.4 sec. 5.2.4.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. Custom Building Products; Prism® Ultimate Performance Grout : www.custombuildingproducts.com/#sle.
   2. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.

C. Grout: ANSI A108, 10 & A118.7 high performance cement grout, color as selected by Architect from standard color options.

2.05 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.
   2. Products:
      a. Merkrete, by Parex USA, Inc; Merkrete Revive: www.merkrete.com/#sle.
      b. Or Approved Equal.

2.06 ACCESSORY MATERIALS

A. Tile Edging and Trim: as indicated on drawings

B. Moisture Barrier: 4 mil thick polyethylene film.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align base and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Install non-ceramic trim in accordance with manufacturer's instructions.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

I. Grout tile joints unless otherwise indicated.

J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

3.05 CLEANING

A. Clean tile and grout surfaces.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1. GENERAL

1.01 SECTION INCLUDES

A. Acoustical ceiling areas indicated on the drawings including:
   1. Suspended T-Bar System

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C-635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   2. ASTM C-636 Standard Recommended Practice for Installation of Metal Suspension Systems for Acoustical Tile and Lay-in Panels.

B. 2019 California Building Code (CBC):
   1. CBC 1616A.1.20 - Modifications to ASCE 7 Section 13.5.6

C. DSA IR 25-2.13 - Metal Suspension Systems for Lay-in Panel Ceilings: 2013 CBC

1.03 QUALITY ASSURANCE

A. Installation by qualified, experienced journeymen, suspended acoustical tile installers with a minimum of 3 years experience with similar projects.

B. Comply with DSA IR 25-2.13 requirements as mandated by the State of California.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size, thickness and fire rating as applicable, legible and intact.

B. Store materials in original protective packaging to prevent soiling, 0physical damage or wetting.

1.05 EXTRA STOCK

A. Provide School District with two (2) full unopened boxes of acoustic tiles of each pattern and size selected and used.

PART 2. PRODUCTS

2.01 MANUFACTURERS

A. Ceiling Tile
   1. Armstrong Acoustical Tile; basis of design
   2. USG
   3. Certainteed

B. Suspension System
   1. Armsrong Ceiling Suspension Systems, basis of design
   2. Chicago Metallic Corporation
   3. Donn Corporation

2.02 MATERIALS

A. Lay In Acoustical Ceiling Units
   1. OPTIMA Square Lay-In, as manufactured by Armstrong World Industries
      a. Sizes: as indicated on drawings
      b. Color: White
      c. Material Ratings:
         1) Noise Reduction Coefficient(NRC): ASTM C 423; 0.95 (UL)
         2) Articulation Class (AC): ASTM E 1111; 190 (UL)
         3) Flame Spread: ASTM E 1264; Class A (UL)
         4) Light Reflectance (LR) White Panel: ASTM E 1477; 0.90
         5) Dimensional Stability: HumiGuard Plus

2. CLEAN ROOM VL Unperforated Square Lay-In 15/16, as manufactured by Armstrong World Industries
    a. Sizes: as indicated on drawings
    b. Color: White
    c. Material Ratings:
        1) Noise Reduction Coefficient (NRC): ASTM C 423; N/A
        2) Articulation Class (AC): ASTM E 1111; N/A
        3) Flame Spread: ASTM E 1264; Class A (UL)
        4) Light Reflectance (LR) White Panel: ASTM E 1477; 0.80

B. Direct attached cementitious wood fiber plank acoustical ceiling system
1. TECTUM Direct-Attached Ceiling Panels, as manufactured by Armstrong World Industries
    a. Sizes: as indicated on drawings
    b. Surface Texture: Course
    c. Composition: Aspen wood fibers bonded with inorganic hydraulic cement
    d. Finish: Surface appearance shall be consistent from panel to panel
    e. Color; Custom coloration as indicated on drawings.
    f. Thickness: Standard 1"
    g. Edge Profile: lond egde/short edge - Bevel, Square
    h. UL Classified Noise Reduction Coefficient (NRC): ASTM C 423; 0.40
    i. UL Classified Flame Spread: ASTM E 1264; Class A. Product must be able to meet this criteria after being painted six times.
    j. Light Reflectance (LR) White Panel: ASTM E 1477; 75%
    k. Dimensional Stability/Mold Resistance: HumiGuard Plus and no significant mold growth when tested by ASTM D3273

C. List of T-Bar Suspension Materials:
1. Grid – As indicated on drawings
2. Main Beam - 7301
3. Cross Tee – XL 7328
4. Hemmed 7/8-inch Angle Moulding - 7800
5. Tie Wires: Use #12 gage galvanized steel wire. Heavy duty class only at suspended light fixtures and mechanical grilles.
6. Seismic RX Solution (ICC-ESR-1308): BERC2 clips

D. List of Direct Attach Materials
1. Accessories:
    a. #6 x 1-5/8" Painted Head Shar Point Screws, item 8188L16
    b. #6 x 1-5/8" Painted Head Drill Point Screws, Item 8188L16
    c. 2-1/4" Painted Head CMU Screws, item 8189L22
2. Attachment Component for Direct Attached to Heavy gauge metal steel
    a. 1-5/8" drill point screws item 8188L16

PART 3. EXECUTION

3.01 INSPECTION

A. Examine surfaces scheduled to receive suspended acoustical tile for unevenness, irregularities, and dampness that would affect quality and execution of work.

B. Mark access provisions as to size and location before beginning installation.

C. Check the work of other trades to verify that other work has been completed to the point where this work may commence.

3.02 INSTALLATION

A. Ceiling Suspension System Installation:
1. Refer to drawings for suspension system general layout. Determine the center of the room and lay the grid out from these lines, except in ceilings in office areas which abut exterior windows. Center suspension system on vertical window mullions.

2. Install per Title 24 Section 2501A.5, DSA IR 25-2.13, ASTM C-636, 2013 CBC and manufacturer's specifications and installation instructions.
3. Install T-bar suspension system to be capable of supporting recessed fluorescent light fixtures. Provide supports and openings for lights, diffusers, grilles or other ceiling penetrations required to complete the installation.
4. Install seismic splay brace wires and vertical struts at 12'-0" o.c. each direction as recommended by ASTM C636 and IR 25-2.13.
5. Wall molding:
   a. Install wall molding at intersection of suspended ceiling and vertical surfaces.
   b. Miter corners where wall moldings intersect or install corner caps.
   c. Apply continuous ribbon of acoustical adhesive or caulking compound on vertical web.
6. Installation Tolerances:
   a. Acoustical surfaces to be free from irregularities and with a maximum variation from flat and level Surface: 1/8 inch in 10 feet.
   b. Maximum variation from flat and level surface: 1/8 inch in 10 feet.
   c. A maximum deflection of 1/260 of the span for suspension system components, hangers, and fastening devices supporting light fixtures, ceiling grilles, and acoustical units. Perform deflection tests per ASTM C-635.
   d. Allowable tolerance of finished acoustical ceiling system is level within 1/8 inch in 12 feet.

B. Acoustical Tile Installation:
1. Install acoustical tile in strict conformance with the manufacturer's recommendations .
2. Place materials to bear all around on suspension members.
3. Minimum width of border tiles is one-half the unit dimension.
4. Seal joints in acoustical units around pipes, ducts, and electrical outlets with caulking compound.
5. Install acoustical units surrounding recessed troffer lights with hold-down clips to prevent movement or displacement of units.

C. Install Tectum Direct-Attached Panels in accordance to manufacturer's installation instructions, mounting type as indicated on drawings

3.03 CLEANING

A. Clean soiled or discolored unit surfaces after installation.

B. Touch up scratches, abrasions, voids, and other defects in painted surfaces.

C. Remove and replace damaged or improperly installed units.

3.04 WARRANTY

A. Provide 30 - Year Performance Guarantee and Warranty, against visible sag, mold/mildew and bacterial growth, when installed with Armstrong Suspension System.

END OF SECTION

SECTION 09 64 66
WOOD ATHLETIC FLOORING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Wood strip sports flooring

B. Sub floor

C. Wall Base

1.02 RELATED REQUIREMENTS

A. Section 03 05 16 - Underslab Vapor Barrier

B. Section 03 30 00 - Cast-in-place concrete

C. Section 08 71 00 - Door Hardware

D. Section 11 66 23 - Gymnasium Equipment: Game standard inserts.

E. Section 12 66 13 - Telescoping Bleachers

1.03 REFERENCES

A. MFMA - Maple Flooring Manufacturers Association

B. MFMA PUR – Performance Uniformity Requirements

C. DIN 108032 (part 2) 2001 - Performance Test

D. DIN 108032 (part 2) 1991 - Performance Test

E. ASTM F2772 - Athletic Performance Properties of Indoor Sports Floor Systems

1.04 QUALITY ASSURANCE

A. Floor System Manufacturer Qualifications
   1. Manufacturer shall be an established firm experienced in field and have been in business or a minimum of ten (10) years.
   2. Manufacturer will be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).

B. Floor Contractor/Installer Qualifications and Certifications
   1. The flooring contractor shall be an accredited installer(s) for the flooring system specified on-site for the duration of the wood floor installation; or, a contractor approved by sport flooring manufacturer
   2. Flooring contractor shall submit a list of at least three completed projects of similar magnitude and complexity completed under current corporate identity.

C. Floor System Design
   1. System design provides heavy load blocking throughout floor area.
   2. The resilient padding provides consistent gradient resiliency. Assures uniform compression deflection transition from light loading to aggressive loading.

D. Floor System Performance
   1. Independent testing report showing the system passing all criteria shall be provided as part of the bid qualification process and submittal process.

1.05 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Data: Provide data for flooring and floor finish materials.

C. Shop Drawings: Indicate floor joint pattern and termination details.

D. Samples: Submit two samples 12 x 12 inch in size illustrating floor finish, color, and sheen.

E. Concrete Guidelines
   1. Submit MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.

2. Submit Robbins Technical Services “Concrete Guide Specification” for further information regarding conditions and requirements of concrete prior to installation.

F. Maintenance Data: Include maintenance procedures and recommended maintenance materials.

G. Maintenance Materials: Furnish the following for Owner’s use in maintenance of project.
1. Extra Flooring Material: 10 square yards matching installed flooring.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials
1. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, marble and terrazzo work is complete, and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained. In- Slab Relative Humidity shall be 85% or less using ASTM F 2170 In-Slab Relative Humidity test. Ideal installation/storage conditions are the same as those that will prevail when building is occupied
2. Materials shall not be stored at the installation location if the In-Slab relative humidity level for the concrete slab is above 85% using ASTM F 2170 In-Slab Relative Humidity test.

1.07 JOB CONDITIONS-SEQUENCY

A. Do not install floor system until concrete has been cured 60 days and the requirements in paragraph 1.06 A are obtained.

B. Ensure slab is clean and free of all dirt and debris prior to floor installation beginning.

C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.

D. After floors are finished, area to be kept secured to allow curing time for the finish. If after required curing time use of the gym is required, the floor shall be protect by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner’s agent) of complete gymnasium floor.

1.08 WARRANTY

A. Provide warranty for material to be free from manufacturing defects for a period of 1 year.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Eclipse SB (anchored) manufactured by Robbins.

B. Or Approved Equal
1. For substitutions refer to Section 01 63 00 - Product Substitution Procedures.

2.02 MATERIAL

A. Vapor Barrier
1. 6-mil polyethylene.

B. Subfloor
1. Manufacturer’s standard subfloor panels with factory attached resilient pads.

C. Maple Flooring Manufacturers Association (MFMA) Wood Flooring:
1. Specie: Northern Hard Maple
2. Seasoning: Kiln Dried (KD)
3. Matching: Tongue and groove side-match and end-match.(TGEM)
4. Type: Finger-Jointed (FJ)
5. Pattern: Straight-lay (One directional)
6. Thickness: 25/32”
7. Facewidth: 2 ¼” facewidth with 2 ½” as acceptable option

8. Grade: 2nd and Better
9. Surface Finish: Industry standard unfinished with Factory Sanded Advantage™ XL as acceptable option
10. Certified Wood: Non FSC
11. Treatment: None

D. Fasteners
1. Flooring – 1-¾” barbed cleats or staples.
2. Subfloor – 1-5/8” to 1-¾” subflooring nails or staples.
3. Channel anchors - 1-1/2” long steel Powers SPIKE® anchors or Tapcons

E. Finishing materials
1. MFMA approved sealer
2. MFMA approved finish

F. Gamelines
1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.

G. Wall Base
1.

H. Fasteners
1. Flooring - 2” barbed cleats or staples.
2. Subfloor - 1” coated staple of equivalent.
3. Sleeper anchors – 2 ½” Powers SPIKE® anchors and sleeves

I. Finishing materials
1. MFMA approved oil-modified Sealer
2. MFMA approved oil-modified Finish

J. Gamelines
1. Gameline paint(s) shall be recommended by the finishing materials manufacturer, and must be compatible with the finish.

K. Vented Cove Wall Base
1. Manufacturer: Tarkett - Johnsonite VCO/VCOC Vent Cove or Approved Equal.
a. Style: Johnsonite Synthetic Rubber Vent Cove Wall Base and Corners
b. coved profile
c. with a .
d. Profile: ventilating type, 4" high and 5/16" thick by 3" long and 3/8" thick toe.
e. Color: Black
2. Adhesive: As recomended by the manufacturer.

PART 3-EXECUTION

3.01 INSPECTION

A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the general contractor and architect in writing:
1. Slab tolerance: Level to within 1/8” in a 10’. To meet the required tolerance confirm that high spots have been ground level and the low spots filled in with approved leveling compound
2. Moisture content of the concrete slab shall not exceed 85% using ASTM F 2170 In-Slab Relative Humidity test.

B. Start of the flooring scope is acceptance that the concrete subfloors meet the requirements for proper floor assembly installation.

C. Subfloor shall be broom cleaned.

D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

3.02 INSTALLATION

A. Vapor Barrier
   1. Install polyethylene with joints lapped a minimum of 6” and turned up 4” at the walls.

B. Subfloor
   1. Position manufacturer’s subfloor panels per manufacturer’s instructions, integrating top layer with adjacent panels. Allow for a ¼” gap at subfloor panel end joints. Provide 1-½” to 2" expansion void at the perimeter and all vertical obstructions.
   2. Install solid blocking at doorways, under bleachers in the stacked position, and below portable goals.
   3. Install Bleacher Blocking per manufacturer’s recommendations.
   4. Properly anchor subfloor panels at each factory designated location.

C. Flooring
   1. Machine nail maple flooring along each edge of the panel’s upper layer, driving up all end joints and proper spacing provided for humidity conditions in specific regions. Consult your local manufacturer’s “Certified” contractor. Provide 1 3/4” expansion voids at the perimeter and at all vertical obstructions.

3.03 FINISHING

A. Sanding
   1. Sand per manufacturer’s recommendations.
   2. After sanding, buff entire floor using 100 grit screen or equal grit sandpaper, with a heavy-duty buffing machine.
   3. Inspect entire area of floor to insure the floor presents a smooth surface without drum stop marks, gouges, streaks or shiners.
   4. Vacuum and/or tack floor before first coat of seal.
   5. Floor should be clean and completely free of dirt and sanding dust.

B. Finishing
   1. Apply specified combination of seal, gameline paint, and finish in accordance with manufacturer’s instructions.
   2. Buff and vacuum and/or tack between each coat after it dries.
   3. Apply game lines accurately after the buffing and vacuuming the coated surfaces. Game lines shall be painted between seal coats and finish coats. Layout in accordance with drawings. For game lines, use current rules of association having jurisdiction. Lines shall be straight with sharp edges in colors selected by architect.

3.04 3.04 WALL BASE INSTALLATION

A. Install vent cove base anchored to walls with base adhesive. Use pre-molded outside corners and neatly mitered inside corner.

3.05 CLEANING

A. Clean up all unused materials and debris and remove it from the premises.

END OF SECTION

SECTION 09 65 00
RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2022.

B. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

C. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 REGULATORY REQUIREMENTS

A. Per **CBC Section 11B-302.1**, Resilient Flooring Shall be stable, firm, and slip resistant.

1.05 SUBMITTALS

A. See Section 01 3300 for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

G. 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 Flooring Material: 40 square feet or 2% whichever is greater, of each type and color.

1.06 WARRANTY

A. Minimum 3 year warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store tiles on a flat surface and squarely on top of one another.

B. Store away from vents and direct sunlight.

C. When palletizing, first place a 5/8" or thicker plywood on the pallet. Stack 2 rows high side by side with no airspace between. Then quarter turn for 2 rows side by side. Do not exceed 12 boxes high. If you are stacking pallets, use 1" thick plywood in between pallets.

D. Store protected dry conditions between 65 and 85 degrees.

1.08 FIELD CONDITIONS

A. The permamenet HVAC System must be on for 7 days prior to, during and after installation between 65 and 85 degrees Fahrenheit or 18 to 29 degrees Celsius

B. Material and adhesive must be acclimated to the installation area for a minimum of 48 hours prior to installation.

1.09 COMPLIANCE

A. Slip Resistance ASTM D2047: ADA Compliant

B. Static Load Limit ASTM F970: 1500 psi

C. esidual Indentation F1914: passes, 8%

D. Flexibility ASTM F137: Passes

E. Resistance to Heat ASTM F1514: Passes

F. Resistant to Light ASTM F1515: Passes

G. sistance to Chemicals ASTM F925: Passes

H. Radiant Flux ASTM E648: / 0.45 W/sq. cm., Class I

I. Smoke Density ASTM E662: Passes, <450

PART 2 PRODUCTS

2.01 RESILIENT TILE

A. Manufacturer as indicated on drawings

B. Product: as indicated on drawings

C. Construction:

D. Class ASTM F1700: ASTM F1700 Class III printed film vynil tile Type B (embossed)

E. Wear-Layer Thickness: 20 mil

F. Overall Thickness: 0.196850393700787 in (5 mm)

G. Nominal Dimensions: 0x0

H. Finish: as standard with manufacturer

I. Backing Class:

J. Installation: Glue Down

1. ACCESSORIES
    a. Adhesives:
        1) Shaw 4100 spreadable 95% RH8 lbspH 10
        2) S150 spray 95% RHNApH 11
        3) Shaw 4151 for high moisture99% RH 10 lbs. pH 12
        4) Shaw 200 for low demand areas85% RH5 lbspH 5-9
        5) Shaw 200 for low demand areas85% RH5 lbspH 5-9
        6) Primer: Shaw 9050
        7) Leveling and Patching Compounds: Use only Portland-based patching and leveling compounds. Do not install resilient flooring over gypsum-based patching and/or leveling compounds.
        8) Take Abatement Coating: Shaw 6200
        9) Barrier Coat Floor Encapulation: Shaww 9000

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with installer present, for compliance with requirements for maximum moisture content, pH, smoothness and level.

B. Proceed with installation after any unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Concrete substrates should be tested for Internal Relative Humidity according to ASTM F 2170 and must not exceed 90% RH.

B. The PH of the concrete sub-floor must be between 7 and 10.

C. Substrates shall be smooth, structurally sound, permanently dry, clean and free of all foreign material such as dust, wax, solvents, paint, grease, oils, old adhesive residue, curing and hardening/curing compounds, sealers, and other foreign material that might prevent adhesive bond.

D. Concrete floors shall be flat and smooth within 1/8" in 6 feet or 3/16" in 10 feet.

3.03 INSTALLATION - GENERAL

A. Layout and Installation

B. Install using conventional tile and plank installation techniques. Plank products shoulkd have a minimum of 6 to 8" seam stagger.

C. Center rooms and hallways so borders are not less than half of a tile or plank.

D. Work out of multiple boxes at the same time.

E. In hallways and small spaces, work lengthwise from one end.

F. Ensure cut edges are always against the wall.

G. To cut products, score the top side of the material with a utility knife. Bend the product and finish the cut throught the backside. It may be necessary to use a heast gun to cut through vertical obstructions. Allow the product to return to room temperature before installation.

H. If you cut the product into a fine point, it may delaminate. Use an ethyl cyanoacrylate-based super glue to fuse the points together. Clean all glue from the top surface immediately. Alcohol-based super glues may cause the vynil to swell.

I. Rol the plank or tile with a 3-section 100 lb roller. Re-roll the floor within the working time of the adhesive.

J. Continue to roll the floor throughout the working day to ensure a proper bond.

K. Use floor protection after installation. DO NOT use a plastic adhesive-based protection system.

3.04 MAINTENANCE

A. Initial Maintenance
   1. Sweep, vacuum or dust mop to remove dirt and grit.
   2. If needed, add neutral cleaner to cool water following the manufacturer's instructions.
   3. Scrub with a low-rpm machine or auto scrubber to retain appearance. Use a pad or brush.
   4. Never use brown or black pads (too aggressive and can damage the product)
   5. Remove the cleaning solution with a wet-dry vacuum or auto scrubber until the floor is dry.
   6. Rinse the floor with clean water. Repeat the rinse process if necessary to remove all haze.

B. Routine Maintenance
   1. Sweep, vacuum or dust mop to remove dirt and grit.
   2. Add neutral pH cleaner to cool water following the manufacturer's instructions.
   3. As needed, scrub with a low-rpm machine or auto scrubber to retain appearance. Use a red (light scrubbing) pad and neutral cleaner following the manufacturer's instructions.

C. Preventative Floor Care
   1. Use walk-off mats that are as wide as the doorway and long enough for soil load and weather conditions.
   2. Use mats with a non-staining backing.
   3. Floor protectors should be used on all furniture legs.
   4. The surface area of the floor protectors should be no less than 1" in diameter.
   5. Full maintenance instructions will be provided by the manufacturer.

END OF SECTION

SECTION 09 65 13
RESILIENT WALL BASE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Resilient wall base

1.02 RELATED SECTIONS

A. Section 03 35 11 - Polished Concrete Finishing

B. Section 09 64 66 - Wood Athletic Flooring

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.

1.04 QUALITY ASSURANCE

A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. An installer is “qualified” if trained, or a certified by the manufacturer or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.06 PROJECT CONDITIONS

A. Install resilient products after other finishing operations, including painting, have been completed.

B. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

C. Maintain the ambient relative humidity between 40% and 60% during installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Bases of Design Manufacturer:
   1. Tarkett North America: www.tarkettna.com

B. Approved Equal
   1. For substitutions refer to Section 01 63 00 - Product Substitution Procedures.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.03 BASIS-OF-DESIGN PRODUCT

A. Tarkett Resilient Tightlock Rubber Wall Base.

1. Height: As scheduled on drawings.
2. Color: As scheduled on drawings.
3. Length: Roll Material
4. Corners: Provide manufacturer's inside and outside corners.

B. Performance requirements meets ASTM F1861 Standard Specification for Resilient Rubber Wall Base, Type TP, Group 1.

C. Test Data:
1. Flexibility, ASTM F137: Passes 1/4 inch mandrel
2. Resistance to light, ASTM F1515: Passes
3. Resistance to chemicals, ASTM F925: Passes
4. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm2 or greater, Class 1.

2.04 INSTALLATION MATERIALS

A. Adhesives: as recommended by Tarkett to meet site conditions
1. Tarkett 960 Cove Base Adhesive (Porous applications)
2. Tarkett 946 Premium Contact Bond Adhesive (Non-porous applications)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Prepare substrates according to Tarkett's written instructions to ensure adhesion of resilient wall base.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base where scheduled on drawings

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.04 CLEANING AND PROTECTION

A. Comply with Tarkett's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
1. Remove adhesive and other blemishes from exposed surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

SECTION 09 65 66
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber sheet flooring with artificial turf

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing.

B. Concrete Substrate: Division 3 Concrete Section(s)

1.03 REFERENCE STANDARDS

A. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015 (Reapproved 2021).

B. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification 2006.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Verification Samples: Actual flooring material specified, not less than 12 inch square.

E. Test Reports: Submit test reports showing compliance with DIN EN 14904.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

H. Manufacturer's Instructions: Indicate standard and special installation procedures and perimeter conditions requiring special attention.

I. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.06 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirement Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in maufacturer's original, unopened, undamaged containers, with identification labels intact.

D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.08 PROJECT CONDITIONS

A. Temperature Requirements: Maintain air temperature in spaces where product will be installed in time period before, during, and after installation as recommended by manufacturer.

B. Field Measurements: Verify actual measurements/openings by feild measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provision.

B. 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 an not a limitation of other rights Owner may have under Contract Documents.

1.10 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from the same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 closeout submittals (Maintenance Materials) Section.
   1. Quantity: Furnish quantity of recycled rubber flooring units equal to 5% of amount installed.
   2. Delivery, Storage, and Protection: Comply with Owenr's requirements for delivery, storage, and protection of extra materials.
   3. Cleaning: Furnish flooring manufacturer's neutral cleaner for initial cleaning and maintenance of the finished floor surface.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Bases of Design Manufacturer:
   1. Ecore: www.ecoreintl.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rubber Sheet Flooring: Two-layer vulcanized rubber.
   1. 2.5mm Vulcanized Composition Rubber surface layer fusion-bonded to 8mm Vulcanized Composition Rubber base layer.
   2. Sheet Width: Minimum 48 inches.
   3. Durometer Hardness: Minimum of 75, when tested in accordance with ASTM D2240.
   4. Color: As indicated on drawings.
   5. Inlaid Logos/Designs: As indicated on drawings

C. Rubber Sheet Flooring with Artificial Turf: 1 layer vulcanized rubber with turf.
   1. 15mm 4735 Vulcanized Composition Rubber shock pad, field-united with a 15mm (5/8" Polyethylene Turf Surface Wear Layer).
   2. Sheet Width: 15' wide.

D. Underlayment: Manufacturer's Monster ShockPad.
   1. 12mm Field-United ShockPad
   2. Sheet Width: Minimum 48 inches.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 05 61 Common Work Results for Flooring Preparation.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius.

C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:
   1. Unroll flooring and allow to relax before beginning installation.
   2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
   3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
   4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
   5. Weld seams using techniques and equipment recommended by manufacturer.
   6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
   7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl wallcovering as specified on the drawings finish schedule.

1.02 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Submit a sample of each type and color to be installed for the architect's approval.

E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

F. Manufacturer's Installation Instructions: Indicate special procedures.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.03 QUALITY ASSURANCE

A. Submit manufacturer's certification that wallcovering furnished meets or exceeds the architect's specification requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver vinyl wallcovering and adhesive to the job site in unbroken or undamaged containers and clearly marked with the supplier's identification label. Store vinyl wallcoverings in a flat position to avoid damage to roll ends. Store materials in a clean, dry storage area with temperature maintained above 55 °F with normal humidity. DO NOT CROSS STACK THIS MATERIAL.

1.05 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions for at least seven days prior to and throughout installation period and for seven days thereafter.

PART 2 PRODUCTS

2.01 VINYL WALL COVERING

A. Shall meet Federal Specification CCC-W408A and the CFFA-W 101-D, Quality Standard for Vinyl Coated Fabric Wallcovering. The wallcovering Type I, Type II or Type III desired shall be specified. The vinyl wallcovering shall contain mildew inhibitors.

2.02 BURNING CHARACTERISTICS

A. The manufacturer shall certify at the time of shipment that the materials furnished meet the published flame spread and smoke development Fire Hazard Classification Rating(s) of those products when tested according to ASTM-E84 Tunnel Test.

2.03 UL LABEL

A. All products shall be UL labeled assuring complete compliance with all specifications and requirements through continuous inspection by UL inspectors

2.04 FIRE DETECTION CHARACTERISTICS

A. The vinyl wallcovering shall contain the Early Warning Effect formulation which provides early warning to potential fire conditions. The vinyl wallcovering shall contain thermoparticulating ingredients which, when heated to approximately 300 °F, emit a colorless, odorless vapor that activates ionization smoke detectors when installed according to manufacturer's specifications Evidence of the Early Warning Effect shall be based on the ASTM E603 standard guide for room fire experiments.

2.05 ADHESIVE

A. The adhesive used must be manufacturer's recommended adhesive and must contain mildew inhibitors.

2.06 PRIMERS

A. The primer used must be manufacturer's recommended primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer shall inspect all areas and conditions under which vinyl wallcoverings are to be installed. Installer shall notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation; work will proceed only when conditions have been corrected and accepted by the installer.

B. Substrate shall be checked with a suitable "Moisture Meter". Moisture shall not exceed 4%.

3.02 PREPARATION

A. Wall surfaces shall be free from defects and imperfections that could show through the finished covered surface.

B. Sand-finished plaster shall be smoothed, cinder or cement blocks shall be plastered, or otherwise rendered smooth, and old wallcoverings shall be removed

C. For new drywall construction, manufacturer's recommended primer should be used before application of wallcovering for ease of future removal when redecorating.

D. Glossy surfaces shall either be sanded to dull surface, or a coat of manufacturer's recommended primer applied prior to installation of wallcovering.

E. If there is any evidence of mildew, it must be removed, and the wall surface treated to inhibit further mildew growth.

F. All painted surfaces should be evaluated for the possibility of pigment bleed-through. If there is any possibility, a coat of sealer, recommended by the manufacturer, should be applied before application of the wallcovering.

3.03 INSTALLATION

A. Wallcovering shall be installed by experienced workers and contractors in strict accordance with the manufacturer's printed instructions using vinyl wallcovering adhesive recommended by the manufacturer (WHEAT PASTE SHALL NOT BE USED). It is absolutely imperative that installer read the manufacturer's instruction sheet in each roll before installing the vinyl wallcovering. Permanent building light shall be available for installation.

B. Installer, before cutting, shall examine pattern and color and determine that they are the correct pattern and color as specified.

C. Installer shall install each roll in sequence starting with largest roll number and each strip in same sequence as cut from roll. If pattern is not random, examine for repeat design. Some patterns should be lined up, matched or reversed for best results. If necessary, trim selvage deep enough to assure color uniformity.

D. After application of three strips, an inspection should be made and if there are any variations in color or pattern which are felt to be excessive, the wallcovering distributor or manufacturer's representative should be notified for his inspection before any further wallcovering is installed

E. Always bring material six (6) inches around inside and outside corners being sure to fit into corners to avoid bridging or spanning

F. The wallcovering should be smoothed to the hanging surface with a stiff bristled sweep brush or a flexible broad-knife to eliminate air bubbles. Avoid burnishing the face of the material

G. Remove excess adhesive along finished seam immediately after each wallcovering strip is applied. Use of clean, warm water, a natural sponge, and clean towels are recommended for this use. It is very important to change water often to maintain cleanliness.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Upon completion of work, remove surplus materials, rubbish and debris, resulting from the wallcovering installation. Leave areas in neat, clean and orderly condition

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 09 78 00
FIBERGLASS REINFORCED WALL PANELS (FRP)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic (FRP) wall paneling adhered to unfinished gypsum wallboard.

B. PVC Trim

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

A. ASTM D790 › Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

B. ASTM D2583 - Standard Test Method forIndentation Hardness of Rigid Plastics by Means of a Barcol Impressor

C. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2023, with Editorial Revision.

D. ASTM D570 - Standard Test Method for Water Absorption of Plastics 2022.

E. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor 2013a.

F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.

G. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels 2022.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. See Section 01 33 00 - Submittals, for submittal procedures.

C. Product Data: Submit manufacturer's descriptive literature for each specified product; include data to indicate compliance with these specificaions. Including: anchorage devices specific to project substrate types.
   1. Preparation instructions and recommendations.
   2. Installation methods including anchorage devices specific to project substrate types..

D. Shop Drawings: Submit elevations for each application and location. Indicate details of joints and attachments.

E. Samples: Submit two samples 4 inches by 4 inches in size, indicating finish, color, and texture for each type of panels.

F. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.

B. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.06 WARRANTY

A. See Section 01 78 36 - Warranties, for additional warranty requirements.

B. Furnish one-year guarantee against defects in material and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. FRP Wall Paneling:
   1. Marlite, Inc; STANDARD FRP: www.marlite.com.
   2. Equal product substitution requests will be considered in accordance with provisions of Section 01 25 10 - Product Options and Substitutions.

2.02 FRP WALL PANELING

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Surface Texture: As indicated on drawings
   2. Color: As indicated on drawings
   3. Panel Thickness: 0.090 inch.

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
   1. Scratch Resistance: Barcol hardness score greater than 30, when tested in accordance with ASTM D2583.
   2. Flexural Strength - 1.7 x 104 psi per ASTM D 790.
   3. Tensile Strength – 8.0 x 103 psi per ASTM D 638.
   4. Tensile Modulus – 9.43 x 105 psi per ASTM D 638.
   5. Water Absorption - 0.17% per ASTM D 570.
   6. Izod Impact Strength of 7.0 ft. lbs./in ASTM D 256

C. Accessories:
   1. Trim:
      a. Material: Vinyl.
      b. Color/Finish: White.
      c. Inside Corner Trim: Standard angle.
      d. Edge Trim: Manufacturer's standard shape.
      e. Division: Manufacturer's standard trim.
   2. Adhesive: Type recommended by panel manufacturer.
   3. Sealant: Type recommended by paneling manufacturer; clear.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate surfaces for adhered items are clean and smooth.
   1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install panels in accordance with manufacturer's instructions.

B. Apply adhesive to back side of panel using trowel recommended by adhesive manufacturer.

C. Apply panels to wall with vertical joints plumb and horizontal joints level and pattern aligned with adjoining panels.

D. Using a roller, apply pressure to panel face to ensure proper adhesion between surfaces.

E. Install panels with manufacturer's recommended gaps for panel field and corner joints.

F. Install trim with adhesive.

G. Seal joints at wall base and between panels with approved sealant to prevent moisture intrusion.

H. Remove excess sealant after paneling is installed and prior to curing.

3.03 ADJUSTING

A. Replace paneling installed out of plumb and/or not aligned with adjacent panels or construction.

3.04 CLEANING

A. Clean panel faces using cleaning agents and methods recommended by manufacturer to remove soiling.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

B. See Section 01 77 00 - Contract Closeout and Final Cleaning.

3.06 PROTECTION

A. Protect installed interior wall paneling from subsequent construction operations.

END OF SECTION

SECTION 09 84 00
ACOUSTICAL WALL TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall Acoustic Finish

1.02 RELATED REQUIREMENTS

A. Section 09 72 00 - Wall Coverings

1.03 SUBMITTALS

A. General: Submit the following in accordance with conditions of contact and Division 1 specification section 01 33 00 “Submittal Procedures”.

B. Product Data: Submit manufacturer’s product data; include product description, fabrication information, and compliance with specified performance requirements.

C. Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
   1. Test reports required are:
      a. Steiner Tunnel Surface Burning Rate Test (ASTM E 84)
      b. ASTM C423
      c. Dynamic environmental testing (ASTM standards D 5116 and D 6670)

D. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.

E. Samples for Verification:
   1. Submit minimum 4-inch by 4-inch sample for each color

F. Maintenance Data: Submit manufacturer’s care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications
   1. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least two (2) consecutive years and which can show evidence of those materials being satisfactorily used on at least three (3) projects of similar size, scope and location. At least three (2) of the projects shall have been successful for use two (2) years or longer.
   2. Manufactured panels must be produced from a minimum of 50% post-industrial recycle content.
   3. Manufacturer must offer a documented reclaim process that will take back, at the manufacturers cost, panels that are at their end-of life cycle. Return process is preceded by following requirements highlighted in Section 02 42 00 Removal and Salvage of Construction Materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver Acoustic Finishes and specified items in manufacturer’s standard protective packaging.

B. Do not deliver Acoustic Finishes, components and accessories to Project site until areas are ready for installation.

C. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.

D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.

E. Before installing Acoustic Finishes, permit them to reach room temperature.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install Acoustic Finishes until spaces are enclosed and weatherproof, and ambient temperatures and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.07 WARRANTY

A. Manufacturer's Special Warranty on polymer panel system: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.

B. Warranty Period: 1 year after the date of substantial completion.

C. The warranty shall not deprive the owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Manufacturer: 3form, LLC., Salt Lake City, Utah, USA / Telephone 801-649-2500

B. Equal product substitution requests will be considered in accordance with provisions of Section 01 63 00 – Product Substitution Procedures.

2.02 MATERIALS

A. Hush Clad produced from Sola Felt
   1. Recycled Rigid PET Felt
   2. Size: Various
   3. Thickness: Sola Felt 3/8"

B. Sheet minimum performance attributes:
   1. Noise Reduction Coefficient (ASTM C423) – 0.35
   2. Dynamic environmental testing (ASTM standards D 5116 and D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality certified.

2.03 MISCELLANEOUS MATERIALS

A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaner: Type recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Acoustic Finishes will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.02 INSTALLATION

A. General: Comply with manufacturer's written instructions for the installation of Acoustic Finishes.

B. Utilize fasteners provided by manufacturer.

C. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

D. Installation to be completed by manufacturer's certified installer. Contact manufacturer for more information.

3.03 CLEANING AND PROTECTION

A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Interior painting and coating systems.

C. Exterior painting and coating systems.

D. Exposed Mechanical, Electrical, and Structural Items

E. Scope:
   1. Finish surfaces exposed to view, unless fully factory-finished or unless otherwise noted..

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 07 19 00 - Water Repellents.

D. Section 09 96 00 - High-Performance Coatings: Other painted metal items.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2020.

C. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

D. SSPC-SP 6 - Commercial Blast Cleaning 2007.

E. SSPC-SP 13 - Surface Preparation of Concrete 2018.

1.04 REGULATORY REQUIREMENTS

A. Conform to T24, CCR for flame and smoke rating requirements for finishes.

B. Conform to T19, CCR for all application processes and safety procedures.

C. Materials shall comply with FDA requirements.

D. Conform to requirements of SCAQMD.

E. 2019 California Green Building Standards Code

1.05 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.06 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Clean-up information.

C. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

D. Maintenance Data: Submit coating maintenance manual including care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of

each color and finish used.

E. 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 Paint and Finish Materials: 1 gallon of each colorand gloss, store where directed.
   3. Label each container with color, type, and gloss in addition to manufacturer's label.

1.07 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.08 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for general requirements for mock-ups.

B. Provide one accent wall as directed by Architect to demonstrate color and finish.

C. Locate where directed by Architect.

D. Approved Mock-up may remain as part of the work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.

C. Paint Materials: Store at a minimum of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.

B. Follow manufacturer's recommended procedures for producing the best results, including testing substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide Dunn Edwards products indicated; Contact Kim Hampton – Kim.Hampton@DunnEdwards.com

B. Acceptable Manufacturers subject to submitting products that meet or exceed performance and physical characteristics of basis of design products:
   1. Sherwin Williams.
   2. PPG.
   3. Vista.

2.02 PAINTINGS AND COATINGS

A. General:
   1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. Provide factory-mixed coatings unless otherwise indicated.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction

C. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, is prohibited and zero VOC colorants should be used whenever possible.

D. Colors: As selected by the Architect.

E. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

2.03 PAINT SCHEDULE - EXTERIOR

A. Cement Plaster: 3 coats
   1. Prime Coat: Primer, alkali resistant, waterbased, Eff-Stop Premium ESPR00.
   2. Intermediate Coat: Latex, exterior, matching topcoat.
   3. Topcoat: Latex, exterior, velvet, Dunn-Edwards, Spartashield SSHL20 100% acrylic

B. Tilt-Up Concrete: 3 coats
   1. Prime Coat: Primer, alkali resistant, waterbased, Eff-Stop Premium ESPR00.
   2. Intermediate Coat: Latex, exterior, matching topcoat.
   3. Topcoat: Latex, exterior, velvet, Dunn-Edwards, Spartashield SSHL20

C. Steel Substrates: 3 coats:
   1. Prime Coat:
      a. Primer (Spot Prime), Bloc-Rust Premium BRPR00.
      b. Primer (Full Prime), Enduraprime Rust Preventative Primer ENPR00.
   2. Intermediate Coat: Latex, exterior, matching topcoat.
   3. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Endura-Coat Eggshell ENTC30 or Spartashield Eggshell SSHL30

D. Galvanized Metal Substrates: 3 Coats
   1. Prime Coat: Primer, waterbased, Ultrashield Galvanized Metal Primer ULGM00.
   2. Intermediate Coat: Latex, exterior, matching topcoat.
   3. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Edura-Coat Eggshell ENTC30 or Spartashield Eggshell SSHL30

E. Aluminum Substrates: 3 coats
   1. Prime Coat: Primer, waterbased,Ultrashield Galvanized Metal Primer ULGM00.
   2. Intermediate Coat: Latex, exterior, matching topcoat.
   3. Topcoat: Latex, exterior, eggshell, Edura-Coat Eggshell ENTC30 or Spartashield Eggshell SSHL30

F. Elastomeric System:
   1. Primer: As recommended by manufacturer for proposed application.
      a. SUPER-LOC Premium (SLPR00
      b. EFF-STOP Select (ESSL00
      c. FLEX-PRIME Select (FPSL00)
   2. Topcoat: ENDURALASTIC 10 Flat (EDLX10), 100% acrylic

2.04 PAINT SCHEDULE - INTERIOR

A. Tilt-up Concrete: 3 coats.
   1. Prime Coat: Primer, alkali resistant, waterbased, Eff-Stop Premium ESPR00.
   2. Intermediate Coat: Latex, interior, matching topcoat.
   3. Topcoat: Latex, interior, eggshell, Spartawall Eggshell SWLL30

B. Gypsum Board Substrates: 3 coats
   1. Prime Coat: Primer sealer, latex, Vinylastic Premium VNPR00.
   2. Intermediate Coat: Latex, interior, matching topcoat.
   3. Topcoat: Paint gloss as scheduled on drawings.
      a. Latex, interior, eggshell, Spartawall Eggshell SWLL30
      b. Latex, interior, semi-gloss, Spartawall Eggshell SWLL50
      c. Latex, interior, flat, Spartazero Flat SZRO10

C. Gypsum Board Substrates (where indicated for enamel paint): 3 coats
   1. Prime Coat: Vinylastic Slect Latex wall sealer (VNSL00)
   2. Intermediate Coat: Enduracat Semi-Gloss Pre-CAtalyzed, water based, single component epoxy (ENPX50)

3. Topcoat: Enduracat Semi-Gloss Pre-Catalyzed, water based, single component epoxy (ENPX50)

D. Galvanized Metal Substrates:
   1. Prime Coat: Primer, waterbased, Ultra-Grip Select UGSL00 or Ultrasheild Galvanized Metal Primer ULGM00
   2. Intermediate Coat: Latex, interior, matching topcoat.
   3. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Spartawall SWLL30,

E. Aluminum (Not Anodized or Otherwise Coated) Substrates:
   1. Prime Coat: Primer, waterbased, Ultra-Grip Select UGSL00 or Ultrashield Galvanized Metal Primer ULGM00
   2. Intermediate Coat: Latex, interior, matching topcoat.
   3. Topcoat: Latex, interior, eggshell, Dunn-Edwards, Spartawall SWLL30

F. Exposed Mechanical, Electrical, Plumbing, and Building Structure in Occupied Spaces:
   1. Overhead Surfaces
      a. Latex dry fall, flat, Aquafall AQUA10

G. Wood Substrates:
   1. Prime Coat: Ultra-Grip Select Zero VOC Acrylic Multi-surface Primer (UGSL00) OR Decoprime Interior Wood Primer (DCPR00)
   2. Intermediate Coat: Latex, interior, matching topcoat
   3. Topcoat: Spartawall Semi-Gloss SWLL50

H. Graffiti Topcoat: VandlGuard IsoFree-Zero VOC Water-Based Aliphatic Polyurethane Coating

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PREPARATION

A. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing. Mask permanent labels for items certified or tested by Underwriter's Laboratories, Warnock-Hersey, or other testing agencies, fusible links, and identification stamps.

B. Clean surfaces thoroughly and correct defects prior to application.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. Remove mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.

E. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk.
   2. Fill bug holes, air pockets, and other voids with cement patching compound.

F. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.

G. Aluminum: Remove surface contamination and oil; wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and blast cleaning according to SSPC-SP 6. Protect from corrosion until coated.

J. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness and a uniform finish.

D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.

E. Walls with Base: Paint the entire wall, including the wall behind the base.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 15 and Division 16 for schedule of color-coding and identification banding of equipment, ductwork, piping, and conduit.

B. Paint shop primed equipment. Do not paint factory-finished items, except where specifically indicated.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

E. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint, to visible surfaces. Paint dampers exposed behind louvers and grilles to match face panels. ·

F. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.05 MECHANICAL, ELECTRICAL WORK

A. Interior: Except where interior mechanical and electrical work is factory-finished, or specified to receive another finish, work occurring in finished rooms and spaces shall be cleaned, pre-treated and painted. Items to be painted include, but are not limited to: steel and copper piping, pipes, vents, fittings, ducts, plenums, miscellaneous supports and hangers, electrical conduit, fittings, pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, miscellaneous metal cabinets, panels and access doors and panels.

B. Exterior: Except where exterior mechanical and electrical work is factory-finished, or specified to receive another finish, work exposed on the exterior of the building shall be cleaned, pre-treated and painted. Items to be painted include, but are not limited to: steel and copper piping, pipes, vents, fittings, ducts, plenums, miscellaneous supports and hangers, electrical conduit, fittings, pull boxes, outlet boxes, unfinished surfaces of plumbing fixtures, miscellaneous metal cabinets, panels and access doors and panels.

3.06 PRIMING

A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Primers specified in painting schedules may be omitted on items factory primed or factory finished items if acceptable to top coat manufacturers.

3.07 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.08 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings for all exposed, unfinished metal including but not limited to:
   1. Rail Barriers
   2. Sheet metal flashing and trim.
   3. Hollow metal doors and frames
   4. Pipe bollards and miscellaneous metal fabrications.
   5. Steel Decking not scheduled to be prefinished.

B. Surface preparation.

1.02 RELATED REQUIREMENTS

A. 05 12 13 - Architecturally-Exposed Structural Steel Framing

B. 05 50 00 - Metal Fabrications

C. 07 62 00 - Sheet metal Flashing and trim

D. 08 11 00 - Hollow Metal Doors and Frames

1.03 REFERENCE STANDARDS

A. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2020.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SCAQMD 1113 - Architectural Coatings 1977, with Amendment (2016).

D. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1 2016.

E. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual Volume 2 2021.

F. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals 2016.

G. SSPC-PA 2 - Procedure for Determining Conformance to Dry Coating Thickness Requirements 2022.

H. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

I. SSPC-SP 2 - Hand Tool Cleaning 2018.

J. SSPC-SP 3 - Power Tool Cleaning 2018.

K. SSPC-SP 6 - Commercial Blast Cleaning 2007.

L. SSPC-SP 11 - Power-Tool Cleaning to Bare Metal 2020.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittal Proceedures

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Product Data: Provide data indicating coating materials .

D. Samples: Submit three 8 -1/2 x 11 inch samples of selected colors.

E. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include cleaning procedures and repair and patching techniques.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Coating Materials: 1 gallon of each type and color.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

B. Single-Source Responsibility: Provide primers and undercoat material produced by the same manufacturer as the finish coats for each type of coating. Use only thinners recommended by the manufacturer and only within recommended limits.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Restrict traffic from area where coating is being applied or is curing.

1.08 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specified Manufacturer: Tnemec Company, Inc., North Kansas City, MO (816/474-3400; regional representative, TPC Consultants, INC., Compton, CA, 310/637-2363).

B. Acceptable Manufacturers: Equivalent products of the following manufacturers:
   1. Ameron Protective Coatings, Brea, CA (714/529-1951 or 800/344-0025).
   2. Carboline Company, St. Louis, MO (800/848-4645).

C. Substitutions will be considered in accordance with the provisions of section 01 6300 - Product Substitutional Procedures

2.02 HIGH-PERFORMANCE COATING SYSTEMS

A. General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

B. Urethane Coating System:
   1. Primer Coating: For shop application at time steel products are fabricated.
      a. Plain steel: Tnemec Series 94-97 Tneme-Zinc, two-component catalyzed epoxy coating at 2.5-3.5 mils DFT.

b. Galvanized steel: Tnemec Series L69 Epoxoline, two-component catalyzed epoxy coating at 2-3 mils DFT.

2. Spot Primer Coating: For field application where primer coating is damaged due to erection, cutting, welding and installation of steel products, Tnemec Series 94-H20 Hydro-Zinc at 2.5 - 3.5 mils DFT over bare metal.
3. Intermediate Coating: For field application over all surfaces of steel products after erection, cutting, welding and installation, Tnemec Series L69 Epoxoline, two-component catalyzed epoxy coating at 2 - 4 mils DFT.
4. Finish Coating: Tnemec Series 1095 Endura-Shield, pigmented, aliphatic, polyurethane coating, semi-gloss sheen at 3mils DFT minimum.
5. Finish Colors: As indicated on the Drawings or, if not indicated, as directed by the Architect from full range of standard colors.

C. Acrylic Polymer System: For Galvannealed Steel Doors and Frames.
1. Prime: Tnemec V115 Uni-Bond at 2.0 to 4.0 mils DFT.
2. Intermediate Coat: Tnemec V115 Uni-Bond at 2.0 to 4.0 mils DFT.
3. Finish Coat: Tnemec 1028 Enduratone at 2.0 to 3.0 mils DFT.

2.03 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

E. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in MPI - Architectural Painting and Specification Manual.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for general requirements for field inspection.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.07 PROTECTION

A. Protect finished work from damage.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Engraved plastic signs.

B. Painted metal signs.

C. Mounting and anchorage.

D. Disabled Access Signage

1.02 RELATED SECTIONS

A. Section 05 40 00 - Cold Formed Metal Framing: Blocking in wood framed walls.

B. Section 06 10 00 - Rough Framing: Blocking in wood framed walls.

1.03 REFERENCES

A. ADA - American with Disabilities Act.

B. T19, CCR - Title 19, California Code of Regulations.

C. T24, CCR - Title 24, California Code of Regulations.

D. 2019 California Building Code (CBC)

1.04 SUBMITTALS

A. Submit under provisions of Section 01 33 0.

B. Shop Drawings: Indicate sign styles, lettering font and size, foreground and background colors, mounting locations, mounting methods, material specifications, and dimensions of each sign.

C. Signage Schedule: Provide a schedule of signage, indicating location, sign type, and text and/or graphics for every sign.

D. Samples: Submit two sample signs of each type, full size, illustrating texture, style, Braille text, letter font, and colors specified. Submit four chains of color options and a contrast chart.

E. Manufacturer's Installation Instructions: Include installation template and attachment devices. Incorporate requirements of Contract Documents.

F. Manufacturer's Certificate: Certify that materials meet or exceed specified requirements, including applicable California codes.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to T24, CCR, and ADA requirements for persons with disabilities.

B. Conform to T19, CCR requirements for fire and life safety.

C. Where regulatory conflict occur, most restrictive in opinion of Architect shall govern.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Package signs, labeled in name groups.

C. Store adhesive attachment tape at ambient room temperatures.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.

1.09 COORDINATION

A. Coordinate signage mounting locations with placement of blocking in wood framed walls and partitions.

PART 2 PRODUCTS

2.01 MANUFACTURERS -PLASTIC SIGNAGE

A. Manufacturers:
   1. Best Mfr. Sign Systems; System HC200 ADA.
   2. Mohawk Sign Systems; Series 200A.
   3. System 2/90 Inc.; Series ADA Integral.
   4. Substitutions: Refer to Section 01 63 00 - Substitution Procedures

2.02 MANUFACTURERS - METAL SIGNAGE

A. Manufacturers:
   1. Best Mfr. Sign Systems; Traffic Sign Series.
   2. Substitutions: Refer to Section 01 60 00. Approved equal.

2.03 PLASTIC SIGNAGE

A. Background material:
   1. Solid color %" THERMOFORMED Kadex; non-static, fire-retardant, and self-extinguishing; impervious to common acids, alkalines, alcohol, solvents, abrasives, and boiling water.
   2. Total Thickness: 1/8 inch minimum; 1/4 inch minimum at toilet room door signs.
   3. Height: As required for text, numbers, graphics and margin; as detailed.
   4. Edges: Square
   5. Color: As selected by Architect from manufacturer's standard color line of not less than 20 colors; core color contrasting with raised text and graphics.
   6. Finish: Matte.
   7. Corners: Rounded, approximately 1/4" radius.

B. Text and Graphics: Raised characters to comply with CBC Section 11B-703.2
   1. Material: Raised tactile surface produced by removing background material not necessary for intended text or graphics; removal to occur with graphics and text through thermoformed process. Applied characters are not acceptable. Matte finish.
   2. Character Color: As selected by Architect from manufacturer's standard color line of not less than 20 colors; minimum 70 percent contrast between text or graphics and background, either light characters on a dark background or dark characters on a light background and have a non-glare finish. CBC Section 11B-703.5.1
   3. Character Depth: 1/32 inch raised, minimum, sans serif, uppercase and be duplicated in braille. CBC Section 118-703.2.5.
   4. Text Height and Font: Raised characters shall be a minimum of 5/8 inch (15.9 mm) and a maximum of 2 inch (51 mm), Sans serif; upper case. CBC Section 11B- 703.2.5
   5. Proportions: It shall be selected from fonts where the width of the uppercase letter "O" is 60% minimum and 110% maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15% maximum of the height of the character. CBC Section 11B-703.4 and 11B-703.6.
   6. Braille Text:
      a. California Contracted Grade 2, raised 1/32 inch minimum and shall comply with CBC Section 11B-703.3 and 11B-703.4. Braille dots shall be domed or rounded and comply with CBC Table and Figure CBC Sec 11B-703.1.
      b. Provide Braille to accompany text at all room identification signs, and at other locations as detailed and required by T24, CCR, and ADA.
      c. Braille to occur a minimum of 3/8" and a maximum of 1/2-inch below text.
   7. Character Spacing: Spacing between individual tactile characters shall comply with CBC Section 118-703.2.7 and 118-703.2.8.
   8. Mounting Height: A tactile sign shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface.
   9. Mounting location: A tactile sign shall be located on the approach side, as one enters or exits rooms or space, and be reached within O" of the required clear floor space per CBC Section and Figure 11B-703.4.2 as follows:

a. A clear floor space of 18" x 18" minimum, centered on the tactile characters, shall be provided beyond the arc of any door swings between the closed position and 45 degree open position.
b. On the wall at the latch side of a single door.
c. On the inactive leaf of a double door with one active leaf.
d. On the wall at the right side of a double door with two active leafs.
e. On the nearest adjacent wall where there is no wall space at the latch side of a single door or no space c!t the right side of a double door with two active leafs.

10. Visual Characters shall comply with CBC Section 11B-703.5 and shall be 40" minimum above finish floor or ground.
11. Pictograms shall comply with CBC Section 11B-703.6.
12. Symbol of accessibility shall comply with CBC Section 118-703.7.
13. Symbol Graphics, Sizes, and Proportions: As detailed in Drawings; pictograms conforming to T24, CCR, and ADA.

2.04 ACCESSORIES - PLASTIC SIGNAGE

A. Anchorage:
1. Vinyl foam tape.
2. Adhesive: Silicone adhesive suitable for vinyl wall coverings and other irregular surfaces.
3. Fasteners: Stainless steel, tamper-resistant, flat or oval head, wood or sheet metal screws as appropriate for substrate.

2.05 METAL SIGNAGE

A. Base Material: 18 gage bonderized steel.

B. Graphics and Text: Screen printed on base material, over painted contrasting background; baked enamel finish.

C. Text: Helvetica medium; upper case; size as detailed in Drawings.

D. Symbol Graphics, Sizes, and Proportions: As detailed in Drawings; pictograms conforming to T24, CCR, and ADA.

E. Background and Copy Colors: As detailed in Drawings, and as selected by Architect from manufacturer's standard color line of not less than 6 colors; minimum 70 percent contrast between text or graphics and background.

F. Corners: Radiused.

G. Mounting Holes: Predrilled.

2.06 ACCESSORIES - METAL SIGNAGE

A. Mounting Post: 2 inch square galvanized steel, perforated on opposing faces to receive bolt anchors; concrete footings as detailed.

B. Fasteners: Tamper resistant sex bolts.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work of this section.

3.02 INSTALLATION - PLASTIC SIGNS

A. Install as detailed; in absence of details, install in accordance with manufacturer's instructions.

B. Install signs after surfaces are finished, in locations indicated in Drawings, and as scheduled herein.

C. Wall Signs: Tape and screw fasten sign to solid substrates, including building finishes; anchor sign to blocking within hollow wall construction. Four countersunk screws per sign.

D. Door signs: Tape and screw fasten signs to solid substrates; 3 countersunk screws per sign to door.

E. Supplement vinyl tape with silicone adhesive where substrate is irregular or vinyl coated.

F. Where placement directions require mounting signs to glazing, anchor sign to glass with vinyl tape, and provide a blank backup plate on opposite side of glass to match color of sign background; fabricate blank to same size as overall sign dimensions. Clean glass immediately prior to mounting to ensure complete adhesion of vinyl tape.

G. Install signs plumb and level, tight to substrate.

H. Conform to all requirements of T24, CCR and ADA for sign placement.

I. Locate room identification signs on wall outside the room as follows:
   1. 60 inches maximum above finish floor to baseline of the highest line of raised characters.and 48 inches minimum above finish floor to the tactile characters on the sign.
   2. Position sign relative to door as detailed in Drawings with a clear floor space of 18 1nches minimum by 18 inches minimum centered on the sign tactile characters per CBC 11B-703.4.2 Location.

J. Locate door signs as follows:
   1. Center of sign 60 inches above finish floor, in center of outside of door.

K. Place informational signs as shown in Drawings.

L. Before fabrication of signs, obtain a final list of room names and numbers from Owner. No signs shall be manufactured or installed until such list has been obtained.

3.03 INSTALLATION - METAL SIGNS

A. Install as detailed; in absence of details, install in accordance with manufacturer's instructions.

B. Bottom of post-mounted signs shall clear the ground by 80 inches.

C. Anchor post-mounted signs with 2 sex bolts per sign.

D. Install other signs on wall or other surface indicated, centered at 60 inches above finish grade; Mechanical anchorage shall be as indicated; use no less than 4 screws to wall surfaces, 1 in each corner.

E. Install signs plumb and level, tight to substrate.

F. Conform to all requirements of T24, CCR and ADA for sign placement.

3.04 PROTECTION OF FINISHED WORK

A. Exercise all means necessary to protect signs before, during, and after installation. In the event of damage, replace signs at no additional cost to Owner.

3.05 SCHEDULES

A. Numbered Signs: Provide one plastic sign per existing and new door into each building space. Allow for up to of 4 characters per sign.

B. Text Signs: Provide one plastic sign per new and existing door into each building space. Allow for up to 15 characters per sign.

C. Exit and Occupancy Signs: As indicated and required per T19, CCR and T24, CCR.

D. Graphic Signs, including text when detailed:
   1. Pictograms, Toilet Rooms: One per door leading into toilet rooms and toilet room vestibules.
   2. Pictograms, International Symbol of Accessibility: One per exterior door leading into usable, non-instructional spaces.

E. Special Signs: Directional, informational, accessibility, stair and elevator signage as indicated and required by T24, CCR and ADA.

END OF SECTION

SECTION 10 21 13
HDPE TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments including the following:
   1. Floor mounted overhead-braced toilet compartments.
   2. Urinal screens

1.02 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet Accessories.

1.03 REFERENCE STANDARDS

A. United States EPA (Environmental Protection Agency) Registration - Bactericidal Surfaces Registered with the U.S. EPA to Legally Make Claims that these Materials Kill Infectious Bacteria.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

1.04 REGULATORY REQUIREMENTS

A. Accessible Toilet Compartments:
   1. Wheelchair accessible compartment shall comply with **CBCSection 11B-604.8.1**.
   2. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with **CBC Section and *Figure* 11B-604.8.1.4**. Toe clearance shall be 9” high minimum above the finish floor and 6" deep minimum beyond the compartment side face of the partition, exclusive of partition support members. It shall be 12" high minimum above the finish floor for children’s use. Partition components at toe clearances shall be smooth without sharp edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66” wide.
   3. Ambulatory accessible compartments shall be provided where there are six or more toilet compartments, or where the combination of urinals and water closets totals six or more fixtures. Such compartments shall be provided in the same quantity as wheelchair accessible compartments per ***CBC Section 11B-213.3.1*** and shall comply with **CBC Section *11B-604.8.2.***
   4. Door and door hardware for accessible compartments shall be self-closing and shall comply with **CBC *Section 11*B-404** except that if the approach is to the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction shall be 44" minimum. ***CBC* Figure 11B-604.8.2**.
   5. A door pull complying with ***CBC Section 11B*-404.2.7** shall be placed on both sides of the accessible compartment door near the latch.
   6. A door pull complying with ***CBC Section 11B*-404.2.7** shall be placed on both sides of the accessible compartment door near the latch.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls.

1.06 SUBMITTALS

A. See Section 01 33 00 - Submittal Proceedures

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Installation Instructions

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings, and type of hardware required.

D. Samples: Submit two samples of partition panels, 4" by 4" inch in size illustrating panel finish, color, and sheen.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

B. Materials: Doors, panels and pilasters, constructed from high density polyethylene (HDPE) resins. Partitions to be fabricated from polymer resins compounded under high pressure, forming a single component which is waterproof, nonabsorbent and has a self-lubricating surface that resists marks from pens, pencils, markers and other writing instruments. Cover all plastic components with a protective plastic masking.

C. Performance Requirements:
   1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with ASTM E 84:
      a. Class A flame spread/smoke developed rating.
   2. Material Fire Ratings:
      a. National Fire Protection Association (NFPA) 286: Pass.
   3. Antimicrobial Touch Surfaces:
      a. Hardware touch surfaces shall be manufactured from substrates that are registered with the U.S. EPA to kill specific bacteria tested according to U.S. EPA protocols.

1.08 WARRANTY

A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Manufacturer:
   1. Scranton Products, 801 E. Corey St.; Scranton, PA 18505; 800-445-5148, www.scrantonproducts.com.

B. Substitutions: See Section 01 63 00 - Product Substitution Proceedures.

2.02 MATERIAL

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.

B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

C. Stainless Steel Castings: ASTM A167, Type 304.

D. Aluminum: ASTM 6463-T5 alloy.

2.03 SOLID PLASTIC TOILET COMPARTMENTS

A. Basis of Design: Hiny Hiders Toilet Partitions

B. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and urinal screens made of solid molded high density polyethylene (HDPE); floor-mounted headrail-braced.
   1. Color: Paisley.
   2. Doors:
      a. Thickness: 1 inch.
      b. Width: 30 inch.
      c. Width for Handicapped Use: 36 inch.
      d. Height: 55 inch.
   3. Panels:
      a. Thickness: 1 inch.
      b. Height: 55 inch.

4. Pilasters:
   a. Thickness: 1 inch.
   b. Width: As required to fit space; minimum 4 inch.
5. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.04 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.

B. Head Rails: Extruded aluminum, anti-grip profile.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.

D. Hinges: Anodized aluminum, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

E. Door Hardware: Chromium-plated brass, manufacturer's standard finish.
   1. Door Latch: Slide type.
   2. Door Strike and Keeper with Rubber Bumper.
   3. Door pull: for ADA complient doors.

F. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in full closed position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Electric hand dryers.

D. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 30 00 - Tiling

B. Section 10 21 13 - HDPE Toilet Compartments.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1999 (Reapproved 2009).

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention, and ADA mounting heights.

1.06 REGULATORY REQUIREMENTS

A. Toilet accessories required to be accessible shall be mounted at heights according to **CBC Section 11B-308** and **CBC Section 11B-309**. See Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Accessories:
   1. As scheduled on drawings; no substitutions allowed.

B. Electric Hand Dryers:
   1. Xlerator; XL-SB: www.exceldryer.com
      a. With ADA complient recessed mounting kit #40502

2.02 MATERIALS

A. 18-8, type-304, heavy-gauge stainless steel. All-welded construction.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted on Fixture Schedule.

2.04 SCHEDULED TOILET ACCESSORIES

A. Combination towel and waste receptical; Mount at ADA required height.

B. Napkin/Tampon Vendor; Mount at ADA required height.

C. Soap Dispensers

D. Mirrors; At accessible sinks mount at ADA required height.

E. Grab Bars; Mounted in configurations indicated on drawings.

F. Combination seat cover, sanitary napkin disposal and toilet paper dispensers; At accessible fixtures mount at ADA required height.

G. Combination seat cover and Toilet Paper Dispensers; At accessible fixtures mount at ADA required height.

H. Electric Hand Dryer: Surface mounted ADA compliant dryer.
   1. Basis of Design; Surface mounted ADA compliant dryer.
      a. : American Dryer, Inc; ExtremeAir EXT: www.americandryer.com.
   2. Voltage: 208 - 240 volts.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Specified in 22 42 00 - Commercial Plumbing Fixtures.

2.06 ELECTRIC HAND DRYERS

A. Basis of Design
   1. XLERATOR; XL-SB: www.xleratordryer.com

B. Model:
   1. XL-SB; Brushed Stainless Steel
      a. With ADA-Compliant Recess Kit: #40502

2.07 JANITOR ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch diameter.
   2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
   4. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.01

A. Toilet paper and feminine napkin dispensers located on the grab bar side on an accessible toilet room or stall should not project more than the grab bar. The accessory shall not be located closer than 1 ½" clear of the tangent point of the grab bar. Accessories surfaced mounted above grab bar will restrict usability.

3.02 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.03 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.04 INSTALLATION

A. Mounting Heights: As required by accessibility regulations.

B. Mounting Heights and Locations: as indicated on drawings and as follows:
   1. Elements of a sanitary facility shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612

2. Grab bars in toilet facilities shall comply with CBC Section 11B-609. Grab bars and any wall or other surfaces adjacent to the grab bar shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:
   a. 1 1/2-inches between the grab bar and the wall.
   b. 1 1/2-inches minimum between the grab bar and projecting objects below and at the ends.
   c. 12-inches minimum between the grab bar and projecting objects above.

3.05 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers and cabinets

B. Accessories.

1.02 RELATED SECTIONS

A. Section 05 40 00 -Cold Formed Metal Framing: Roughed in wall openings.

1.03 REFERENCES

A. ADA - Americans with Disabilities Act.

B. FM - Factory Mutual Listing Service.

C. NFPA 10 - Portable Fire Extinguishers.

D. T24, CCR - Title 24, California Code of Regulations.

E. UL - Underwriters Laboratories.

F. UL 299 - Dry Chemical Fire Extinguishers.

G. UL 711 - Rating and Fire Testing of Fire Extinguishers.

H. Title 19 C.C.R.- Public Safety

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate cabinet dimensions, rough-in measurements for recessed cabinets, and locations.

C. Product Data: Provide operational features of extinguishers, hose racks, cabinets and accessories, colors, finishes, and anchorage details.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.05 OPERATION AND MAINTENANCE DATE

A. Submit under provisions of Section 01 70 00

B. Maintenance Data: Include test refill or recharge schedules and re-certification requirements.

1.06 QUALITY ASSURANCE

A. Provide units conforming with UL 711.

1.07 REGULATORY REQUIREMENTS

A. Conform to T24 & Title 19 CCR and NFPA 10 and must comply with CBC Sections 11B-307, 11B- 308, 11B-309 and 11B-403

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Potter-Roemer.

B. Larsen’s Manufacturing Co.

C. Substitutions: Under provisions of Section 01 63 00 - Product Substitution Procedures.

2.02 EXTINGUISHERS

A. Dry Chemical Type: UL 299; steel cylinder with pressure gage, hose and horn; steel valve assembly; FM approved.

2.03 MOUNTING

A. Fire-Protection Cabinet
   1. .Basis-of-Design Product: Potter Roemer; Div. of Smith Industries, Inc. or a comparable product by one of the following:
   2. Cabinet Type: Suitable for fire extinguisher locations as indicated and detailed on drawings.
   3. Cabinet Material: Enameled-steel sheet.
   4. Semi-recessed cabinet: Roemer Model 7008
   5. Door Material: Steel sheet.
   6. Door Style: Fully glazed panel with frame.
   7. Door Glazing: Tempered float glass (clear).
   8. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
      a. Provide projecting door pull and friction latch.
      b. Provide manufacturer's standard hinge permitting door to open 180 degrees.
   9. Accessories:
      a. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, with plated or baked-enamel finish.
   10. Finishes:
      a. Manufacturer's standard baked-enamel paint for the following:
         1) Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
         2) Interior of cabinet and door.
   11. ACCESSORIES
      a. Wall Brackets: 16 gage formed steel, red polyester coated, for surface-type wall anchorage.
      b. Bracket Anchors: Minimum #10 round head wood screws, with 2 inch penetration into framing.
   12. FINISHES
      a. Extinguisher: Polyester powder-coated; red.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall openings under provisions of Section 01 03 90.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 SCHEDULE

A. Extinguishers:
   1. Science Laboratories and Preparation Areas: Extinguisher UL listed for 4A:60B:C hazards; Potter-Roemer Model 3005, or equivalent.
   2. All Other Areas: Extinguisher UL listed for 2A:10B:C hazards; Potter-Roemer Model 3005, or equivalent.

END OF SECTION

SECTION 10 51 29
PHENOLIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Phenolic lockers.

B. Phenolic Integrated benches.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

1.03 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit manufacturer's technical data sheets for materials, fabrications, furnishings, fasteners, and hardware.

C. Shop Drawings: size, dimensions, material thickness, trim, hardware, furnishings, doors, bases, locks and installation details.

D. Maintenance Information- refer to Compact™Structural Laminates by Formica Group Technical Data.

E. Samples: Submit sample of phenolic patterns and colors.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer's original packaging until ready for installation.

B. Compact sheets should be stored horizontally, with a caul board or other protective sheet placed on top to protect the material from possible damage. The material should be protected from moisture, and should never be stored in contact with the floor or an outside wall. Optimum conditions for storage are approximately 75°F (24°C), and 45% to 55% relative humidity.

1.05 COORDINATION

A. Field Measurements: Accurate field measurements are required for shop drawings, fabrication and installation of lockers and accessories.

1.06 QUALITY ASSURANCE

A. Manufacturer shall have a minimum or 10 years experience in fabrications of phenolic materials.

B. Installer shall be approved by the manufacturer and have not less than 5 years experience in the installation of modular phenolic locker systems.

C. Manufacturer shall provide a representative to supervise installation.

1.07 WARRANTY

A. Provide warranty for products to be free of defects in workmanship for a period of Twenty (20) years from the date of purchase when properly shipped, stored, handled, installed and maintained under normal use.

B. Warranty the hinges integrated into the aluminum extrusions (profiles) for Ten (10) years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design; Foreman Locker Systems.

B. Substitutions: See Section 01 63 00 - Product Substitution Proceedures.

2.02 MATERIALS

A. Specifications based on modular, knock-down lockers constructed of solid phenolic panels, aluminum extrusions (profiles), integrated hinges and strikes, and stainless steel hardware.

1. Panel material shall be constructed of phenolic treated kraft papers combined with Melamine- impregnated decorative surface papers, consolidated in a press at high temperatures.
   a. Acceptable Product: Wilsonart Compact Laminate MC-BC0525, or equivalent.
   b. Phenolic panel materials shall have a fire test rating of ASTMA E-84 Class B (standard).
   c. Panel types:
      1) Doors shall be made of 0.3750 inch (9.53 mm) thickness solid phenolic material, radius edges and polished smooth on exposed edges.
      2) Bottoms, tops and shelves shall be 0.3750 inch (9.53 mm) thickness solid phenolic material, radius edged and polished smooth.
      3) Interior back and sides panels shall be 0.3750 inch (9.53 mm) thickness solid phenolic material.
      4) Exterior finish end panels and filler panels shall be 0.3750 inch (9.53 mm) thickness solid phenolic material, radius edges and polished smooth.
      5) Finish filler panels shall be 0.3750 inch (9.53 mm) thickness solid phenolic material.
2. Profiles
   a. Profiles shall be aircraft grade aluminum extrusions.
   b. Profile shall be 26mm diameter; wall and inner members 3 mm thick, panel slots 10 mm capture depth.
   c. Custom finish and color as indicated on drawings.
3. Hardware
   a. Hinges
      1) Hinges shall be made of 3.5 mm thickness extruded aluminum.
      2) Frame wing shall be extruded aluminum continuous with length of the door openings and sealed with a plastic insert.
      3) Continuous nylon hinge pin secured by top and bottom set screws.
      4) d. Door wing fastened with through-bolts to door panels
   b. Latch/ Hasp
      1) shall be made of anodized heavy duty cast aluminum with a 10 mm padlocking hole.
   c. Strike Plates
      1) 3.5 mm thickness extruded aluminum
      2) Integrated into the profile and continuous with length of the door opening.
      3) Side mount hook to be aluminum, attached with 2 fasteners
      4) Fasteners shall be stainless steel
4. Bases
   a. As detailed on drawings
5. Numbering Plates: standard plastic by manufacturer
6. Locker Colors
   a. Panels cores: Black
   b. Interior panels: white
   c. Door panels, finish end panels, filler panels: as indicated on drawings

2.03 LOCKER SIZES AND CONFIGURATIONS

A. Sizes and Configurations: as indicated on drawings

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine installation site for satisfactory preparation. Notify architect of unacceptable preparation or conditions

B. Do not install lockers until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install lockers in accordance with manufacturer’s instructions for plumb, level, rigid, flush and square.
C. Anchor lockers according to manufacturer’s instructions.
D. Install lockers on base specified in shop drawings.
E. Install required filler and finish panels according to shop drawings
F. Attach number plates per specs
G. Install locking mechanisms according to manufacturer’s instructions.
H. Adjust doors and locks, and remove installation tools and materials

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 11 40 01
CUSTOM STAINLESS-STEEL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Custom fabricated stainless steel units, including:
   1. Stainless Steel Counters
   2. Preparation table
   3. Pass-through window sills at transaction windows

1.02 RELATED REQUIREMENTS

A. 06 41 00 - Architectural Casework

1.03 REFERENCE STANDARDS

A. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel 2017, with Amendment (2021).

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittal Proceedures

B. Submit dimensioned fabrication drawings for custom fabricated items including plans, elevations, and sections, showing materials and gauges used.. Prepare drawings at the following minimum scales:
   1. Plans: 1/4-inches = 1-foot-0-inches
   2. Elevations: 1/2-inches = 1-foot-0-inches
   3. Sections: 1/2-inches = 1-foot-0-inches

C. Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Firms shall have been regularly engaged in the manufacture of Foodservice Equipment of the types, capacities, and sizes required, whose products have been in satisfactory use in similar service for no fewer than five (5) projects.

B. Installer's Qualifications: Installer shall have completed no fewer than five (5) Foodservice Installations similar in material, design, and extent to that indicated for this Project, which have resulted in satisfactory in-service performance.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver fixed equipment that is not to be integrated into structure until after completion of finished ceilings, floor and walls, painting, and lighting.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.07 FIELD CONDITIONS

A. Field Measurements: Take field measurements before ordering and fabrication, to assure accurate fit of fabricated items.

1.08 CODES AND STANDARDS

A. Accessibility
   1. The top of counter at transaction windows shall be 28 inches minimum and 34 inches maximum above the finish floor or ground.
   2. Concessions equipment required to be accessible shall conform to all reach requirements in CBC Figures 11B-308.2.1 - 11B-308.3.2 (CBC Section11B-308).
   3. Space and elements within concessions work areas shall meet the requirements of CBC Section 11B-203.9.

B. Guidelines for Seismic Restraint of Kitchen Equipment as published by SMACNA and approved by DSA.

C. Welding per California Fire Code Chapter 26

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless Steel: Provide ASTM A666 / AISI Type 304 non-magnetic sheets, free of buckles, waves, and surface imperfections; Blend and regrain as required to effect matching and continuous finished product..

B. Stainless Steel Tube: Provide ASTM A554, Type 304 with No. 4 polished finish. All tubing shall be round unless specified otherwise.

C. Sound Deadening: Provide coating of water resistant sound deadening material at underside of all stainless steel tops. Sound deadening material shall be non-aging and not become brittle. Material shall be paintable when dry.

D. Sealants: Provide ASTM C920, Type S, Grade NS, Class 25, Use NT. When fully cured and washed, sealant shall meet the requirements of the Food and Drug Administration Regulation 21 CFR 177.2600 for use in areas where sealant comes in contact with food.

2.02 CUSTOM FABRICATED UNITS - GENERAL REQUIREMENTS

A. See drawings for dimensions and configurations; ensure proper fit by taking field measurements prior to fabrication.

B. Pass Through Window Sill:
   1. Extend adjacent counter top at transaction windows to provide shelf on exterior side of opening.
   2. Dimensions as detailed on drawings.

2.03 FABRICATION

A. Joints, Bends, and Edges: Make each joint close fitting, especially butt and contact joints.
   1. Make brake bends free of open-texture or orange peel appearance.
   2. Make sheared edges free of burrs, projections, and fins.
   3. Neatly finish mitered and bullnosed corners with under edge of material ground to uniform condition and polished. No overlapping materials or cracks.

B. Fasteners: No exposed screw or bolt heads will be acceptable. Rivets, if specified, shall be countersunk and ground flush, and of the same material as the pieces joined together. Butt joints made by riveting straps under seams and then filling with solder will not be accepted.

C. Stainless-steel Tops:
   1. Fabricate of 14-gauge stainless steel, one-piece welded construction, with exposed edges rolled and with corners bull nosed.
   2. Reinforce on underside with galvanized steel channels welded in place so tops can support heavy weights without deflection. Provide cross braces at not more than 30-inches on center.
   3. Where tops are adjacent to walls or adjoining equipment, provide integral splashes with all corners, both vertical and horizontal, coved a minimum of 1/2-inch radius.
   4. Splashes shall be a minimum of 6-inches high including a 1-inch horizontal return to wall and 1-inch vertical drop (for 'Z' clip installation) and enclosed ends.
   5. Field joints in tops are to be sanitary, tight and without open seams, by means of welding or by properly designed draw fastenings, or commercial joint material to suit the purpose required; 1/8-inch tolerance for silicone maximum.

D. Undershelves:
   1. Construct of 16-gauge stainless steel.
   2. Open Base Shelving: Edges shall be rolled down on open sides.
      a. Neatly notch corners and welded tightly to legs, with tight joints at all intersections of shelf and leg..
      b. Reinforce shelving longitudinally with 14-gauge formed channel welded to underside.

E. Welding: Make each welded joint smooth, ductile, and watertight, without gaps, holes, or discoloration or marring of surface adjacent to welds.
   1. Welding:

a. Stainless Steel: Comply with AWS D1.6/D1.6M.

2. Use welding processes and filler metal compatible with material being welded. Do not use carbon arc welding on surfaces that will be exposed to view in finished work.
3. Grind exposed welds flush with adjacent material; finish and polish to match adjacent surface.
   a. Avoid excessive heating of metal and metal discoloration.
   b. When grinding, use iron-free abrasives, wheels, and belts that have not been used on carbon-steel.
   c. Remove pits, runs, sputter, cracks, low spots, voids, buckles, and other imperfections.
   d. Remove grain of rough grinding by several successively finer polishings until specified finish is attained.
4. When welding sheet, penetrate entire thickness for entire length of joint; make joints flat, continuous and homogeneous with sheet metal without reliance on straps under seams, filling with solder, or spot welding.
5. When stainless steel is joined to dissimilar materials, use stainless steel for fastening devices and welding material.
6. Protection Against Corrosion: Eliminate possibility of corrosion wherever welding occurs on stainless steel, and minimize possibility of carbide precipitation in welding bolts and screws.
7. When welding galvanized steel, thoroughly clean and repair damaged galvanizing and coat welds with polyurethane coating.
8. Where bolts or screws are welded to underside of tops or trim, finish and undepress the exposed side of welds.
9. Coat welds and discolorations that are not exposed to view in finished work with metallic-based paint to prevent the possibility of progressive corrosion of joints, unless welds are ground and polished smooth.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with fabricator's instructions and recommendations, plumb and level and in proper locations, ready for utility connections.

B. Lay out work in advance to prevent damage to building, piping, wiring, or equipment; cut, fit, and patch where necessary; coordinate work with others.

C. Do not cut or fit units in the field; if adjustments are necessary due to inadequate field measurement prior to fabrication, take unit back to shop and perform modifications there.

D. Do not field weld unless absolutely necessary; weld and grind field joints in accordance with specified fabrication procedures.

E. Securely anchor and attach non-mobile or adjustable-leg equipment to walls, floors, or bases with stainless steel bolts.

F. Follow SMACNA (SRM) seismic restraint recommendations for project location.

3.02 ADJUSTING

A. Adjust new and existing equipment to ensure proper operation.

3.03 CLEANING

A. Remove masking or protective covering from stainless steel and other finished surfaces.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor anchors for tensioned elements.

C. Floor sleeves for equipment posts.

D. Wall mounted protection pads.

E. Gym divider curtains.

F. Indoor Volleyball nets and posts.

G. Score Boards and Scoring Console

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete floor slab to receive floor sleeves and anchors.

B. Section 05 12 00 - Structural Steel: Structural members supporting basketball systems

C. Section 09 65 66 - Resilient Athletic Flooring: Gymnasium flooring.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

B. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2022).

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.05 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.

E. Samples: Submit samples of wall pad coverings as indicated on drawings

F. Operating and maintenance data for each operating equipment item.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. GREENGUARD certification program. Provide GREENGUARD certificate or equivalent test results.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified with minimum five years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gymnasium Equipment:
   1. Draper, Inc: www.draperinc.com.
   2. Performance Sports Systems: www.perfsports.com.
   3. Porter Athletic Equipment Company: www.porterathletic.com.
   4. Jaypro Sports: www.jaypro.com

B. Wall Mounted Protection Pads:
   1. Basis of Design: Sports Graphics.
   2. Manufacturers of equivalent products submitted and approved in accordance with Section 01 63 00 - Product Substitution Procedures.

C. Gymnasium Dividers:
   1. Basis of Design: Jaypro Sports; FC-680 Motorized: www.jaypro.com.
   2. Manufacturers of equivalent products submitted and approved in accordance with Section 01 63 00 - Product Substitution Procedures

D. Score Boards
   1. Basis of Design: DAKTRONICS: BB-2107 SCOREBOARD; www.daktronics.com
   2. Manufacturers of equivalent products submitted and approved in accordance with Section 01 63 00 - Product Substitution Procedures.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
   1. National Federation of State High School Associations (NFHS) sports rules.

C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

D. Hardware: Heavy duty steel hardware, as recommended by the manufacturer.

E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 GYMNASIUM DIVIDER CURTAINS

A. Fold-Up Gymnasium Divider Curtains:
   1. Operation: Electrically operated, accordian style fold-up action..
   2. Size: 84 feet wide by 28 feet high to underside of support structure.
   3. Drive System: UL Listed, 1 HP, 110VAC 60hz Single-phase compensating type instantly reversible winch, direct drive, self-lubricating gearing, with built-in POSILOK TM over-speed arrest system, and integral limit switches to control curtain travel. .

4. Hoist Cables: 1/8” diameter aircraft cable, galvanized, 1800-pound break strength. Spaced 9’-3” on-center and 6” inward from curtain edges. Secured to top drive pipe and bottom batten. Cables constrained by cable spool guides on drive pipe to ensure straight and compact rolling action.
5. Fold Pattern:
   a. Symmetric: Hoist cables weaved through #4 metal grommets spaced 18" on-center to allow symmetric curtain fold balanced about the curtain centerline.
6. Drive pipe: 2-3/8" outer diameter galvanized pipe supported by drive pipe carriers.
7. Configuration:
   a. Solid Vinyl & Vinyl Mesh Combination
      1) Lower Section of Curtain: 8’-0” high, 18 ounces per square yard solid vinyl, washable, resistant to fade, rot, mildew, and fungus. Fire retardant ratings meeting requirements of NFPA 701 Test Method 2, ASTM E-84 Class A, and State of California test requirements. Color to be selected from manufacturers standard colors.
      2) Upper Section of Curtain: 9 ounces per square yard vinyl mesh, washable, resistant to rot, mildew, and fungus. Fire retardant ratings meeting requirements of NFPA 701 Test Method 2, State of California test requirements, and Fed. Std 191 Method 5903.2. Color to be selected from manufacturers standard colors.
8. Internal Seams: All seams electronically RF welded vertically with 1" contact weld for resistance to tearing and breakaway.
9. Side Edges: Triple turned with double welds.
10. Curtain Top: 6" pocket formed with horizontal weld to conceal 1.66" outer diameter top batten pipe supported from drive pipe carrier assemblies by No. 2/0 coil proof chain.
11. Curtain Bottom: 8" padded pocket formed with horizontal weld to conceal 1.66" outer diameter bottom batten pipe.
12. Attachment: Rigidly suspended from building structure with heavy duty clamp style fittings.
13. Control System: Wall mounted, three-position momentary contact key switch with polished wall palte located so the operator has full view of curtain during operation. Coordinate location with Architect prior to rough-in.

2.04 BASKETBALL

A. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.
   1. Framing: Center strut; forward folding framing.
   2. Folding Control System: Electric hoist that folds backstop with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
   3. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
   4. Framing Color: As selected from manufacturer's standard selection.
   5. Product: EZ Fold TF-20 manufactured by Draper, Inc: www.draperinc.com.

B. Backboards: Tempered glass, rectangular shaped.
   1. Frame: Brushed aluminum edge, steel mounting.
   2. Provide conversion frame, mountable on both assemblies designed for fan shaped backboards and assemblies designed for rectangular backboards.
   3. Markings: Painted.
   4. Provide safety padding for bottom edge of backboard.
   5. Provide mounting kit.
   6. Color: As selected from manufacturer's standard selection.

C. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
   1. Net Attachment Device: Tube-tie.
   2. Finish: Powder coat orange.

2.05 FLOOR-MOUNTED EQUIPMENT

A. INDOOR Volley Ball Nets and Posts: One court system of adjustable posts, net, and tensioning winch meeting all requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
   1. Posts: 3-1/2 inch O.D. 11 ga steel tube with 1 inch height adjustments between 42 and 96 inches.
   2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
      a. Top Hem Reinforcing: 2000 pound minimum break strength galvanized aircraft cable in nylon coating.
      b. Bottom Hem Reinforcing: 1/4 inch diameter braided nylon rope with spring loaded, pressure type rope tensioner.
      c. Size: Regulation size.
   3. Manufacturers:
      a. Draper, Inc; Steel: www.draperinc.com. BASIS OF DESIGN

B. Floor Anchors for Portable Gymnasium Equipment: Steel plate bolted into wood flooring, and/or cast into concrete with center screw-down button for securing tensioned elements; installed flush with finish surface.
   1. Screw Size: 1/2 inch diameter, with 13 threads per inch.

C. Floor Sleeves for Posts: Metal sleeve, with latch cover, cast into concrete subfloor with Concrete base to hold poles for nets and goals; installed flush with finish floor surface.
   1. Latch Cover: Brass, round; tamper resistant lock with key.
   2. Sleeve: Aluminum.
   3. Depth of Sleeve: 9 inches from floor surface to bottom, including latch cover.

2.06 WALL PROTECTION PADS

A. Type: Fabric covered urethane wall protection pads;

B. Pad shape and size: Custom Sizes and shapes as indicated on Drawing Elevations.

C. Cushioning material: 2 inches thick open cell polychloroprene latex compound filler

D. Backer: 7/16 inch Urea-fomaldehyde-free wood bcking. Pad that wrap around columns or are curved shall be provided without solid backer.

E. Cover: Solid vynil coated polyester fabric with embossed pattern:
   1. Weight: 14 ounces per SY.
   2. Density: 6 pounds
   3. Resistant to rot, mildew, and ultraviolet light.
   4. Flammability: Rated self extinguishing in accorandance with California State Fire Code F-230.
   5. Color: As indicated on drawings.

F. UL GREENGUARD Gold Certification: Entire wall pad assembly shall have been submitted to indoor air quality evaluation (IAQ) evaluation in accordance with UL 2811 test method to show compliance with emissions limits on UL 2818 Section 7.1 and 7.2. Materials are tested in accordance with ANSI/BIFMA M7.1-2011 and determined to comply with ANSI/BIFMA X7.1-2011 and ANSI/BIFMA e3-2014e credit 7.6.1, 7.6.2 and 7.6.3. Material of emissions of total volatile orgnic compounds of < 0.22 mg/m3, formaldehyde < 0.0135 ppm, total aldehydes <0.043 ppm, individual volatile organic compoundsw < 1/1000 TLV and <1/2 chronic REL and total phthalates < 0.01 mg/m3. Manufacturer must be able to provide independent laba nd test reports to verify compliance.

G. ASTM: Pads shall meet all requirements of ASTM 2440-04. Manufacturer must be able to provide independent lab and test reports to verify compliance.

H. Construction: Cushioning material adhered to backer and panel fully wrapped with fabric which is stapled to backer such that backers is not exposed on front or sides.

I. Provide 1 inch wide fabric flanges at panel bottom and top and Z clips at bottom and top for wallo mounting panels.

J. Attachement: Provide pads without solid backing with Z mounting clips top and bottom.

2.07 SCOREBOARD

A. Single-sided basketball scoreboard displays period time to 99:59, HOME and GUEST scores to 199, PERIOD to nine, team FOULS to 19, PLAYER number to 99, player FOUL to nine, T.O.L. (time outs left) to nine and indicates possession and bonus. During the last minute of the period, scoreboard displays time to 1/10 of a second. Scoreboard can also score volleyball, wrestling and any sport requiring a clock, score and period function.

B. General Information
   1. Dimensions: 6'-0" high, 10'-0" wide, 0'-6" deep
   2. Base weight: 260 lb (may increase with options)
   3. Base power requirement: 220 W (wattage may increase with opttions)
   4. Colors: As selected from manufacturers 150 colors

C. Construction
   1. All-aluminum construction
   2. Scoreboard back, face, and perimeter: 0.063" thick
   3. Cabinet withstands high-velocity impact from air-filled sports balls without the need for protective screens

D. Digits & Indicators
   1. LED digit technology:
      a. PanaView® – discrete LEDs protrude through the scoreboard face
   2. LED colors:
      a. Amber clock/colon, PERIOD, PLAYER/FOUL and T.O.L. digits and bonus indicators with Red score and FOULS digits and possession indicators.
   3. Clock and score digits: 13" high
   4. PERIOD, FOULS, PLAYER/FOUL and T.O.L. digits: 10" high
   5. Bonus indicators: 4" high
   6. Possession arrows: 3" high
   7. Seven bar segments per digit

E. Captions
   1. Vinyl applied directly to scoreboard face
   2. HOME and GUEST captions: 6" high
   3. PERIOD, FOULS/SCORE, PLAYER/FOUL/MATCH and T.O.L. captions: 4" high
   4. Color: standard white

F. Horn
   1. Vibrating horn mounted inside the scoreboard cabinet behind the face
   2. Sounds automatically when period clock counts down to zero
   3. Sounds manually as directed by operator

G. Accessory Equipment
   1. Vinyl striping applied around the clock and scoreboard face
   2. Double bonus indicators in place of single bonus indicators

2.08 SCORING CONSOLE

A. Console is an All Sport® 5000 controller

B. Scores multiple sports using changeable keyboard inserts

C. Controls multiple scoreboards, stats displays and shot clocks, including other All Sport 5000 controlled displays currently owned by customer

D. Recalls clock, score, and period information if power is lost

E. Runs Time of Day and Segment Timer modes

F. Console includes
   1. Rugged aluminum enclosure to house electronics
   2. Sealed membrane water-resistant keyboard
   3. 32-character backlit LCD to verify entries and recall information currently displayed
   4. Power cord that plugs into a standard grounded outlet; 6 watts max
   5. Control cable to connect to the control receptacle junction box
   6. Hand-held switch for main clock start/stop and horn

G. Accessory Equipment
   1. Hard carrying case
   2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Coordinate fabrication of wall protection pads with size and location of switches, electrical outlets, and other wall mounted items; structural framing and bracing projecting from wall surface; and door and other wall openings.

C. For pads placed around structural columns coordinate required shapes and sizes with actual dimensions of structural members.

D. Verify that electrical services are correctly located and have proper characteristics.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Protection mats:
   1. Mount protectin pads 5 inches above finished floor
   2. Secure to wall with Z clips along top and bottom. Type, size and spacing of fasteners as recommended by manufacturer.
   3. Neatly make cutouts for switches, electrical outlets, and other items on wall and seal with matching vinyl fabric.

C. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

D. Install equipment rigid, straight, plumb, and level.

E. Secure equipment with manufacturer's recommended anchoring devices.

F. Separate dissimilar metals to prevent electrolytic corrosion.

G. Test the operation of the scoreboard, controller and all control jacks; leave control unit in carrying case and other loose items with owner's designated representative. Conduct operator training on the scoreboard/controller operation.

3.03 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.04 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 12 52 19
UPHOLSTERED SEATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Custom upholstered cushions attached to corridor seating millwork.

B. Related Sections:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 06 41 00 - Architectural Woodwork.

1.02 REFERENCES

NFPA 260 - Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture

1.03 SUE

A. Product Data: Submit complete manufacturer's descriptive literature.
   1. Shop Drawings:
      a. Indicate anchorage items, accessory items, and finishes.
      b. Provide seating plan at 1/4-inch scale, showing seating construction and dimensions.

B. Samples: Submit samples of the following items for acceptance-review.
   1. Fabric and upholstery foams, 20 inches square.

C. Certificate of Flame Resistance: Submit copy of California Flame Resistance certificate

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver seating components in protective packaging during transit and job storage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Bases of Design fabric manufacturer: As specified on drawings.

2.02 MATERIALS

A. Upholstery Fabric:
   1. As specified on drawings.
   2. Must pass CAL TB 117-2013

B. Padding:
   1. High resilient, flexible polyurethane foam (FPF) encapsulated with an approved interlining material.
   2. FPT shall comply with CBC 803.1.1

PART 3 - EXECUTION

3.01 EXAMINATION

A. Field verify accuracy of chair measurements shown on drawings.

3.02 INSTALLATION

A. Fixed seating in accordance with manufacturer's recommendations.

B. Attach upholstery to frame with Velcro mounting strips.

END OF SECTION

SECTION 12 66 13
TELESCOPING BLEACHERS

PART 1 - GENERAL

1.01 SECTION INCUDES

A. Telescoping Bleachers and Accessories

1.02 RELATED SECTIONS

A. 03 30 00 - Cast-in-Place Concrete

B. 09 64 29 - Wood Strip and Plank Flooring

C. 26 05 44 - Sleeves and Sleeve Seals for Electrical Raceways and Cabling

1.03 REFERENCES

A. California Code of Regulations, Title 24, Part 2, 2013 California Building Code

B. ICC 300-2012 Standards for Bleachers, Folding and Telescopic Seating, and Grandstands.

C. DSA Interpretation of Regulations IR16-5.07, Design and Construction of Reviewing Stands, Grandstands and Bleachers: 2019 CBC.

1.04 SUMMARY

A. It is the intent of the following specification to set forth the performance criteria and design parameters for the telescopic seating equipment for this facility. Where brand names and/or models are described it is for the purpose of establishing a quality standard, and not to exclude the products of other manufacturer's that comply with these specifications.

1.05 DESCRIPTION OF THE SYSTEM

A. The bleacher system shall be comprised of multiple tiered, closed deck seating rows operating on the telescopic principle, and stacking vertically in minimal floor area when not in use. The first moving row shall be secured with both friction and mechanical locks. All other rows shall be mechanically locked, operable only upon unlocking and cycling the first row. Each bleacher row shall be comprised of risers, seat and deck components, and a complete set of supportive columns and braces. The operative system shall incorporate a locking system permitting the discretionary securement of one, several or all rows in the use or stacked position.

1.06 SUBMITTALS

A. Submit data sufficient to demonstrate compliance with specifications and drawing requirements.

B. Submit manufacturer's descriptive literature and installation instructions in accordance with Section 01 33 00 - Submittal Proceedures.

C. Submit operating and maintenance manuals in accordance with Section 01 70 00 - Contract Closeout.

D. Submit samples of products and materials where options of color, finish, pattern or texture exist

E. Proposed Substitute Products: Submit complete shop drawings and structural calculations (signed and stamped by the manufacturer's professional engineer in charge of design licensed in the state of California) for architectural/engineering review, approval and submittal to the Division of the State Architect.

1.07 QUALITY ASSURANCE

A. Products and materials to be provided are to be from manufacturers regularly engaged full-time in the manufacture or production of this and similar items, with a history of successful manufacture or production acceptable to the Owner. Additional documentation shall include:

1. Evidence of a pre-approval (PC) by the Division of the State Architect Office of Structural Safety, including Approval “A” number. Bleacher systems which have not been pre-approved by DSA will not be acceptable.
2. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material, except where product or material is superior in quality to industry trade standards.

B. Deviation: It will be the responsibility of the bidder to furnish with his bid a list and clarification of deviations from this specification. Those bidders not submitting a list of deviations will be deemed to have bid exactly in accordance with these specifications.

C. Insurance Coverage: Bidder shall submit manufacturer's certification of insurance coverage for the life of the product.

D. Product Improvements: Seating provided shall incorporate manufacturer's design improvements and materials current at time of shipment.

1.08 GUARANTEE

A. Provide under provisions of Division 01

B. Limited Guarantee: The manufacturer shall guarantee all work performed under these specifications to be free from defects for a period of one (1) year, plus an additional four (4) year extended warranty as follows:
   1. Extended warranty for materials and labor for years 2 - 5 shall include performing annual inspections in accordance with ICC-300.
   2. Annual Inspections shall be performed by a technician/installer trained and certified by the manufacturer.

1.09 REGULATORY REQUIREMENTS

A. Telescoping Bleachers:
   1. Provide microphone and scoreboard outlets in an accessible location.
   2. Provide accessible seating per the seating requirements of CBC Section 11B-221.

1.10 DESIGN CRITERIA

A. Telescopic bleacher design and fabrication shall comply with Section 1021, California Building Code, 2013 Edition, and shall be designed to support and resist in addition to their own weight, a force of:
   1. Seatboards and footboards shall be designed to resist a live load of 120 lbs. per linear foot.
   2. 100 lbs. per square foot of live load.
   3. Side sway load of 24 lbs. per linear foot.
   4. Front to rear sway load of 10 lbs. per linear foot of row.

B. Railings, posts and sockets designed to withstand the following forces applied separately:
   1. 50 lbs. per foot acting outward at top rail.
   2. 25 lbs. per foot acting outward at mid-rail.

C. Steel components shall be cold-formed from appropriate width strip stock.

D. Lumber components as load carrying members shall be fabricated from Southern Pine boards graded and stamped as "B & BTR KD" and meeting the requirements for "Dense Industrial KD" in accordance with S.P.I.B. Grading Rules 1983 edition.

E. Plywood deck boards shall be fabricated from Southern Pine or Douglas Fir Premium underlayment (interior C-D plugged and fully face sanded) with exterior glue, 5 ply minimum, solid crossband directly under face ply, species Group 1, dry condition of service (16% moisture content maximum), and manufactured in accordance with PS-1-83 for Construction and Industrial Plywood published by the National Bureau of Standards August 1, 1983.

1.11 DSA DEFERRED APPROVAL

A. Installation of telescopic bleachers specified herein and indicated on the drawings shall not be started until detailed plans, specifications and engineering calculations have been accepted and signed by the architect or engineer in charge of design and the signature of the architect or engineer who has been designated responsible to cover the work shown on a particular plan or specification, and approved by the Division of the State Architect.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products of the following manufacturer form the basis of design and standard of quality:

1. Hussey Seating Company: Model MAXAM MXM26.

B. Products of other manufacturer's may be considered equivalent provided they meet or exceed requirements of this specification. Substitutions shall be in accordance with Div 01 of the contract documents. The District or District's representative shall be the sole judge of the equivalency of any proposed substitution.

C. Quantity/Size(s): Provide seating bank length and number of rows as shown on the drawings.
   1. Type: Wall-Attached

D. Dimensions:
   1. Rise per row: 9-5/8"
   2. Row to row spacing: 26"

2.02 INTEGRAL POWER OPERATION

A. Integral Power: Furnish and install Hussey PF Power Frame, an integral automatic electro-mechanical propulsion system to open and close telescopic seating. Integral Power and Control System shall be Underwriters Laboratories, Inc. (UL) approved and listed. Systems which are not UL Listed, or are UL Recognized are not acceptable.
   1. Power drive system shall be located in the second row telescoping frames on every section to allow for full programmability of the first row. Power frame drive systems, tractor type systems, wind-up chain or link drive systems which drive the first row, and which limit modular flexibility are not acceptable.
   2. Operation shall be with a removable pendant control unit which plugs into seating bank for operator management of stop, start, forward, and reverse control of the power operation. Each Powered Frame unit shall consist of output shaft gear reducer with 6" diameter x 4" wide wheels covered with non-marring 1/2" thick composite rubber. Reducers shall be fitted with induction motors, which will provide an average operating speed of 25 f.p.m. Power drive wheels system shall be integrated into the 2nd tier bleacher rolling frames at and shall provide tractive force at the point of maximum loads. Additional weights shall be in the form of heavy steel ingots housed in specially designed trays at the rolling frame locations. The use of concrete or other materials to provide additional weight is not acceptable. Motors and drive system shall be completely enclosed to reduce the accumulation of dust and debris and to protect operating mechanisms from damage.
   3. System shall incorporate both open and closed limit switches, which will automatically stop integral power operation when seating has reached the fully extended or closed position. Power operation shall utilize a combination of contactors and limit switches to insure the wiring is not energized except during operation. Straight wired electric systems are not acceptable.

B. Operating Loads: Each Powered Frame provides (220 / 550) lbs pull force which equals approximately (28 / 35) lbs. psi lateral force on the floor.
   1. Electrical: Seating Manufacturer shall provide all wiring within seating bank including pendant control. Each unit is power operated by a 1/2 horsepower, 1725 R.P.M., 208 Volts, 50/60 Hz., three phase 1.25 service factor motor, with a full load current of 2.2 amperes. Power supply required shall be 120/208 volts three phase 4 wire plus ground service with 20 amps. Motors, housing, and wiring shall be installed and grounded in complete accord with the National Electric Code.
   2. The electrical contractor shall provide required power source with no greater than 4% voltage drop at the seating junction box. The electrical contractor shall perform all wiring connections in junction box that are attached to or a part of the building.
   3. Electrical service shall be run from the building power source in approved conduit in accordance with governing electrical codes. All work shall be performed by a licensed electrical contractor. Contractor shall furnish all conduit and wiring, plus 12" x 12" x 4" junction boxes and manual disconnects (Square "D" model DU 322 or equivalent). The electrical contractor shall perform the connections to the seating equipment at the junction box and control station. Motors, housing, and wiring shall be installed and grounded in complete accord with the National Electric Code.

2.03 ACCESSORIES

A. Modular First Row: Provide for wall-attached bleachers, Flex-Row manually configurable modular first tier. The first seating row shall consist of individual modular sections 2 to 7 seats wide, and shall be capable of being configured to provide ADA wheelchair seating spaces, team seating, scorer's areas, or other truncated clear areas, on an event-by-event basis. Each modular unit shall have an unlock lever for easy deployment. Modules shall automatically lock into position when fully opened, and shall be provided with black full-surround steel skirting with no more than ¾" floor clearance, and a black injection molded end cap for the nose beam for safety and improved aesthetics. Permanent cutouts or retractable sections/truncations which require the use of tools, permanent or removable front railing, separate motor operation, or recoverable sections which cannot be deployed in one minute or less are unacceptable. Each ADA wheelchair seating space shall be provided with a companion bleacher seat where shown on the drawings. The use of loose chairs as companion seating is acceptable only in areas where indicated on plans.

B. Foot Level Aisles: Provide deck level full width vertical aisles located as indicated or in accordance with code requirements. Aisles shall be equipped with intermediate steps and handrails. Intermediate steps shall be boxed fully enclosed type construction with blow molded end caps with full radius on all four edges. Step shall have non-skid on surface. Aisle handrails shall be single pedestal mount, 34" high with terminating mid rail. Handrails shall be attached to the socket and shall rotate 90° for self-storage in socket. Aisle handrails that must be detached from the socket for storage are unacceptable. Provide at the front edge of each aisle step, an adhesive-backed abrasive non-slip tread surface.

C. Aisle Handrails: Shall be Auto-Rotating single pedestal mount, 34" high with terminating mid rail. Handrails shall be designed to automatically rotate 90° from the stored to use position and back with the opening and closing of the seating system, requiring no manual operation or assistance. Handrails which must be removed or manually operated for storage or self-storing handrails with non-continuous loops are unacceptable.

D. End Guard Rails: Provide steel self-storing 42" high above seat, end rail with tubular supports and intermediate members designed with 4" sphere passage requirements.

E. Safety End Closures: Provide at each exposed bleacher end, a self-storing end safety closure curtain to close off the underside of the bleachers. The curtain shall be designed to open and close with the bleachers, and shall be constructed of heavy 14 oz. vinyl, cut and welded to the precise contour of the bleachers. Curtain shall be attached to the rear wall and the first row of the bleacher, and shall be designed so as to maintain 3" clearance above the floor. The curtain shall be attached to each bleacher row by means of an offset bracket and support chain which attaches through heavy duty brass grommets in the closure. The bottom of the curtain shall have a Link-Machine Chain in a welded pocket to prevent the closure from being lifted when in the open position. The curtain shall be available in 12 standard colors, and each closure shall include safety warnings.

F. CourtSide Graphic Logo: Provide for each end of each seating row a decorative graphic logo that is applied to the integrally molded end cap recess area of the CourtSide 10 XC or 12XCS seat module. Logo shall be approximately 4.7" (h) x 3.5" (w) w/full color CMYK vector art output on Fuji-Flex crystal archive printing material. Logo shall be laminated with a 5-mil Hard Guard Matte laminate bonded to a Flex-Con L - 606 laminating adhesive layer, trimmed to a precise custom cut shape with two mounting holes.

G. XTREME Graphic Logo: Provide for Gymnasium One Main Seating Bank. Logo shall be comprised of decorative artwork and/or text that has been permanently bonded to the front vertical surface of the bleacher seat modules. The artwork is "tiled", a process whereby a single large graphic is segmented and applied in separate parts to individual seat modules, which, when viewed together as a whole become a unified piece of artwork, similar to a mosaic. The graphics are printed as full color CMYK pigmented resin and adhesive layer onto a 100UM polyester clear glossy release film (transfer sheet). The application process uses a combination of heat and pressure to activate the adhesive and permanently bond the resin to the HDPE seat module. Once applied, the graphic cannot be removed from the seat module without

damaging or destroying the seat module surface. The Architect or Owner shall provide vector-based digital artwork.

2.04 MATERIALS

A. Lumber: ANSI/Voluntary Product 20, B & B Southern Pine.

B. Plywood: ANSI/Voluntary Product PS1, APA A-C Exterior Grade.

C. Structural Steel Shapes, Plates and Bars: ASTM A 36.

D. Uncoated Steel Strip (Non-Structural Components): ASTM A569, Commercial Quality, Hot-Rolled Strip.

E. Uncoated Steel Strip (Structural Components): ASTM A570 Grade 33, 40, 45, or 50, Structural Quality, Hot-Rolled Strip.

F. Uncoated Steel Strip (Structural Components): ASTM A607 Grade 45 or 50, High-Strength, Low Alloy, Hot- Rolled Strip.

G. Galvanized Steel Strip: ASTM A653 Grade 40, zinc coated by the hot-dip process, structural quality.

H. Structural Tubing: ASTM A500 Grade B, cold-formed.

I. Polyethylene Plastic: ASTM D 1248, Type III, Class B; molded color-pigmented, textured, impact-resistant, structural formulation; in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

J. Fasteners: Vibration-proof, of size and material standard with manufacturer.

2.05 FABRICATION

A. Wheels: Not less than 5" diameter by 1-1/4" with non-marring soft rubber face to protect wood and synthetic floor surfaces, with molded-in sintered iron oil impregnated bushings to fit 3/8" diameter axles secured with E-type snap rings.

B. Lower Track: Continuous Positive Interglide (CPI) system interlocks each adjacent CPI unit using an integral, continuous, anti-drift feature and through-bolted guide at front to prevent separation and misalignment. Each CPI unit shall contain a Low Profile Posi-Lock LX to lock each row in open position and allow unlocking automatically. Provide adjustable stops to allow field adjustment of row spacing.

C. Slant Columns: High tensile steel, tubular shape.

D. Sway Bracing: High tensile steel members through-bolted to columns.

E. Upper Guide: High tensile steel through-bolted to nose and riser. Interlocks with adjacent upper tier to prevent separation and misalignment. Provide adjustable stops to allow field adjustment of row spacing.

F. Deck Support: Securely captures decking for entire length of section.

G. Section Lengths: Each bank shall contain sections not to exceed 25’-6” in length with a minimum of two supporting frames per row, each section.

H. Housing and Rear Riser: Continuous roll formed galvanized steel members.

I. Attachment: Through-Bolted fore/aft to deck guides, and frame cantilevers.

J. Decking: 5/8", AC grade, tongue & groove, transversely oriented plywood, interior type with exterior glue, 5-ply, all plies Southern Pine with plugged cross bands, produced in accordance with National Bureau of Standards PS-1-83. Longest unsupported span: 21 ½”.

K. Deck End Overhang: Not to exceed frame support by more than 5'-7".

L. Seats: Shall be Courtside XC10 Plastic Seat System. Polyethylene Plastic shall be ASTM D 1248, Type III, Class B; molded, color-pigmented, textured, impact-resistant, structural formulation. Seats shall be single piece construction consisting of 18" long unitized, interlocking, engineered, 100% recyclable HDPE (high density) polyethylene modules providing scuff resistant dual textured 10" wide anatomically comfort contoured seat surface. Unit shall be tested to 600 lbs occupant load. Seat module shall be of one-piece construction with ½”

minimum interlock on seat and face. Seat shall be designed with internal reinforcement and shall be cantilevered to the rear with an integral rear closure panel, to allow for a “continuous clean sweep” of debris at deck level. Row ends shall be equipped with integrally-molded end caps for a clean finished appearance. Seats with exposed seat brackets or without integral rear and end closures are not acceptable. Each seat module shall be securely anchored by means of a 12 gauge steel clamp bracket providing steel-to-steel through bolted attachment to the front nose beam of the bleacher eliminating fore/aft movement of the seat module. Seat module shall be designed with recess pockets to accept (optional accessory) seat number and row letter plates. Each row end shall have an integrally molded recess to accept (see “Accessories”) graphic logo inserts.

2.06 SHOP FINISHES

A. Understructure: For rust resistance, steel understructure shall be finished on all surfaces with black "Dura-Coat” enamel. Understructure finish shall contain a silicone additive to improve scratch resistance of finish.

B. Wear Surfaces: Surface subject to normal wear by spectators shall have a finish that does not wear to show different color underneath.

C. Steel nosing and rear risers shall be pre-galvanized with a minimum spangle of G-60 zinc plating.

D. Decking shall be finished with a moisture repellent sealer coat and an additional high gloss clear urethane finish on use surfaces.

E. Wood Seats (if applicable) shall be triple sanded and finished with a sealer coat a high gloss clear urethane finish on use surfaces.

F. Railings: Steel railings shall be powder-coated in one of the manufacturer’s fifteen (15) standard colors..

G. Safety Finishes: All exposed metal and wood structure both on top surfaces and beneath bleachers shall be eased, coined or chamfered to minimize the possibility of injury, and all areas which are “off-limits” to all but authorized personnel shall be so labeled. Products with exposed die-cut or stamped metal edges or with exposed sharp corners are not acceptable.

2.07 FASTENINGS

A. Welds: Performed by welders certified by AWS standards for the process employed.

B. Structural Connections: Secured by structural bolts with prevailing torque lock nuts or free-spinning nuts in combination with lock washers.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verification of Conditions: Verify areas to receive telescoping bleachers are free of impediments interfering with installation and condition of installation substrates is acceptable to receive telescoping seating in accordance with manufacturer's recommendations.

B. Do not commence installation until conditions are satisfactory.

3.02 INSTALLATION

A. Manufacturer's Recommendations: Comply with telescoping bleacher manufacturer's recommendations for product installation requirements.

B. General: Install telescoping bleachers in accordance with manufacturer's installation instructions and final shop drawings. Provide accessories, anchors, fasteners, inserts and other items for installation of telescoping gym seats and for permanent attachment to adjoining construction.

3.03 ADJUSTMENTS AND CLEANING

A. Adjustments: After installation completion, test and adjust each telescoping bleacher assembly to operate in compliance with manufacturer's operations manual.

B. Cleaning: Clean installed telescoping seating on both exposed and semi-exposed surfaces. Touch-up finishes restoring damage or soiled surfaces.

C. Remove all debris from work site.

3.04 PROTECTION

A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer to ensure telescoping gym seats are without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 21 13 00
AUTOMATIC FIRE SPRINKLERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies automatic sprinkler systems for buildings and structures. Materials and equipment specified in this Section include:
   1. Pipe fittings, valves, and specialties of domestic manufacture.
   2. Sprinklers of domestic manufacture.

B. Products furnished but not installed include sprinkler head cabinet with spare sprinkler heads. Furnish to the Owner's maintenance personnel. Coordinate with the school representative for the location of head cabinet.

1.02 RELATED SECTIONS

A. The following Sections contain requirements that relate to this Section:
   1. Division 10 Section "Fire Extinguishers, Cabinets, and Accessories" for fire extinguishers
   2. and extinguisher cabinets.
   3. Division 22 Section "Plumbing Identification" for labeling and identification of fire protection piping systems and components.

1.03 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Other definitions for fire protection systems are listed in NFPA Standard 13.

C. Working Plans as used in this Section means those documents including drawings and calculations prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the authority having jurisdiction.

1.04 SYSTEM DESCRIPTION

A. FIRE PROTECTION SYSTEM is a "Wet-Pipe" system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by fire.

1.05 SUBMITTALS

A. Product Data for each type of sprinkler head, valve, piping and fire protection specialties.

B. Shop Drawings prepared in accordance with NFPA 13 identified as "Working Plans," including hydraulic calculations where applicable, and which have been approved by the authority having jurisdiction.

C. Maintenance Data for each type of sprinkler head, valve, piping and fire protection specialties, for inclusion in operating and maintenance manual specified in Division 01 and Division 22 Section "Common Work Results for Plumbing."

D. Welder's qualification certificates.

E. Test Reports and Certificates including "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping" as described in NFPA 13.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installation and alterations of fire protection piping, equipment, specialties, and accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified means experienced in such work experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project, familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction.

Upon request, submit evidence of such qualifications to the Architect. Refer to Division 01 Section "Definitions and Standards" for definitions for "Installers". Installer shall have valid State of California Contractor's License.

B. Qualifications for Welding Processes and Operators: Comply with the requirements of AWS D10.9, Specifications for Qualifications of Welding Procedures and Welders for Piping and Tubing, Level AR-3."

C. Regulatory Requirements: Comply with the requirements of the following standards:
   1. NFPA 13 - Standard for the Installation of Sprinkler Systems.
   2. UL and FM Compliance: Fire Protection system materials and components shall be Underwriter's Laboratories Listed and labeled, and Factory Mutual approved for the application anticipated.

1.07 SEQUENCING AND SCHEDULING

A. Schedule rough-in installations with installations of other building components.

1.08 EXTRA MATERIALS

A. Valve Wrenches: Furnish to Owner 2 valve wrenches for each type of sprinkler head installed.

B. Sprinkler Heads and Cabinets: Furnish six extra sprinkler heads of each style included in the project. Furnish each style with its own sprinkler head cabinet and special wrenches as specified in this Section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide fire protection system products from one of the following:
   1. Gate Valves:
      a. Tyco.
      b. Kennedy Valve, Div. of ITT Grinnell Valve Co., Inc.
      c. Stockham.
      d. Or approved equal.
   2. Swing Check Valves:
      a. Tyco.
      b. Kennedy Valve, Div. of ITT Grinnell Valve Co., Inc.
      c. Stockham.
      d. Or approved equal.
   3. Grooved Mechanical Couplings:
      a. Victaulic Company of America.
      b. ITT Grinnell.
      c. Stockham.
      d. Or approved equal.
   4. Water Flow Indicators:
      a. Tyco.
      b. Reliable Automatic Sprinkler Co., Inc.
      c. Victaulic Company of America.
      d. Viking Corp.
      e. Potter-Roemer.
      f. Or approved equal.
   5. Sprinkler Heads:
      a. Tyco.
      b. Reliable Automatic Sprinkler Co., Inc.
      c. Viking Corp.
      d. Automatic Sprinkler Corp. of America.
      e. Central Sprinkler Corp.
      f. Firematic Sprinkler Devices, Inc.
      g. Globe Fire Equipment Co.

h. Guardian Automatic Sprinkler Co., Inc.
i. ITT Grinnell.
j. Or approved equal.

2.02 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3 Article "Pipe Applications" for identification of systems where the below-specified pipe and fitting materials are used.

B. Steel Pipe: ASTM A135, Schedule 10 and Schedule 40, black steel pipe, plain ends as manufactured by Wheatland or equal. Manufacturer's thin-wall pipe is not acceptable.

2.03 FITTINGS

A. Cast-Iron Threaded Fittings: ANSI B16.4, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

B. Malleable-Threaded Fittings: ANSI B16.3, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

C. Steel Fittings: ASTM A234, seamless or welded, for welded joints.

D. Grooved Mechanical Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47 Grade 32510 Malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.

E. Grooved Mechanical Couplings: Consist of ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.

F. Cast-Iron Threaded Flanges: ANSI B16.1, Class 250; raised ground face, bolt holes spot faced.

2.04 JOINING MATERIALS

A. Welding Materials: Comply, with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

B. Gasket Materials: Thickness, material, and type suitable for fluid or gas to be handled, and design temperature and pressures.

2.05 GENERAL DUTY VALVES

A. Gate Valves - 2 Inch and Smaller: Body and bonnet of cast bronze, 175-pound cold water working pressure - non-shock, threaded ends, solid wedge, outside screw & yoke, rising stem, screw-in bonnet, and malleable iron hand-wheel. Valves shall be capable of being repacked under pressure, with valve wide open.

B. Gate Valves - 2-1/2 Inch and Larger: Iron body; bronze mounted, 175-pound cold water working pressure - non-shock. Valves shall be solid taper wedge; OS&Y, rising stem; flanged bonnet, conforming to ASTM A126 Class B; replaceable bronze wedge facing rings; flanged ends; and packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open.

C. Swing Check Valves: MSS SP-71; Class 175, cast iron body and bolted cap conforming to ASTM A126, Class B; horizontal swing, with a bronze disc or cast-iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitting while the valve remains in the line.

2.06 SPECIALTY VALVES

A. Alarm Check Valves: 175 psig working pressure, designed for horizontal or vertical installations, and have cast iron, flanged inlet and outlet, bronze grooved seat with "O" ring seals, single hinge pin and latch design. Provide trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, drip cup assembly piped with check valve to main drain line, and fill line attachment with strainer.

2.07 AUTOMATIC SPRINKLERS

A. Sprinkler Heads: Fusible link type and style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal 1/2-inch discharge orifice, for "ordinary" temperature range.

B. Sprinkler Head Finishes: Provide heads with the following finishes:
   1. Upright, Pendant, and Sidewall Styles: Chrome plated in finish spaces, exposed to view; rough bronze finish for heads in unfinished spaces and not exposed to view. Heads shall be wax coated when installed exposed to acids, chemicals, or other corrosive fumes. On all exposed heads, install approved wire mesh head guard.
   2. In all areas of the building with finished ceilings, install concealed type fire sprinkler heads.
      a. Concealed Style: Rough brass with painted white cover plate.
      b. Flush Style: Bright chrome with painted white escutcheon plate.

C. Sprinkler Head Cabinet and Wrench: Finish steel cabinet, suitable for wall mounting, with hinged cover and space for 6 spare sprinkler heads plus sprinkler head wrench. Provide a separate cabinet for each style sprinkler head on the project.

2.08 ALARM DEVICES

A. General: Types and sizes shall mate and match piping and equipment connections.

B. Water Flow Indicators: Vane type water-flow detector, rated to 250 psig, designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 Volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover which sends a signal when cover is removed. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full-open position.

PART 3 - EXECUTION

3.01 PIPE APPLICATIONS

A. Install Schedule 40 black steel seamless or welded pipe joined by threaded fittings referenced in Table 6.4.1 NFPA 13 or by fitting used with pipe having cut grooves.

B. Install Schedule 10 black steel pipe with welded or roll-grooved ends and grooved pipe and fitting for sizes up to 5”.

C. Black steel pipe shall be listed in Table 6.3.1.1 NFPA 13.

3.02 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate the general location and arrangement of piping systems. So far as practical, install piping as indicated.

B. Deviations from approved "Working Plans" for sprinkler piping require written approval of the authority having jurisdiction and the Mechanical Engineer. Written approval shall be on file with the Architect prior to deviating from the approved "Working Plans."

C. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.

D. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions in pipes 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

F. Install flanges or flange adapters on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

G. Hangers and Supports: Comply with the requirements of NFPA 13. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems. Provide coupling manufacturer's written instructions, for rigid systems. Provide protection from damage where subject to earthquake in accordance with NFPA 13.

H. Make connections between underground and above-ground piping using an approved transition piece strapped or fastened to prevent separation.

I. Install mechanical sleeve seal at pipe penetrations in foundation walls.

J. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

K. Install pressure gage on the riser or feed main at or near each test connection. Provide gage with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and where they will not be subject to freezing.

3.03 PIPE JOINT CONSTRUCTION

A. Welded Joints: AWS D10.9, Level AR-3.

B. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Joint pipe, fittings, and valves as follows:
   1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
   2. Align threads at point of assembly.
   3. Apply appropriate tape or thread compound to the external pipe threads.
   4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
   5. Damaged Threads: Do not use pipe with threads that are corroded or damaged. If a weld opens during cutting or threading operations, that portion of a pipe shall not be used.

C. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

D. Mechanical Grooved Joints: Grooves on pipe ends dimensionally compatible with the couplings.

E. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.04 VALVE INSTALLATION

A. General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13 and authority having jurisdiction.

B. Gate Valves: Install supervised-open gate valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide permanently marked identification signs indicating the portion of the system controlled by each valve. Refer to Division 22 Section "Plumbing Identification" for valve tags and signs.

C. Install check valves in each water supply connection.

D. Alarm Check Valves: Install valves in the vertical position, in proper direction of flow including the bypass check valve. Install valve trim in accordance with the valve manufacturer's appropriate trim diagrams. Test valve for proper operation.

3.05 SPRINKLER HEAD INSTALLATION

A. Use proper tools to prevent damage during installations.

B. Where heads are subject to damage, such as in storage rooms, mechanical rooms, custodian rooms, gymnasiums, shower and locker rooms, etc., install approved type protective metal basket head guards.

C. In all removable or modular patterned ceilings, install all sprinkler heads centered on the modular ceiling panels.

3.06 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13.

B. Replace piping system components that do not pass the test procedures specified, and retest repaired portion of the system.

3.07 CORROSION PROTECTION

A. All below ground metallic fittings, valves, flanges, bolts, etc., installed under this Section of the Specifications, shall be protected against corrosion.

3.08 COORDINATION WITH OTHER TRADES

A. The Contractor shall review the fire sprinkler design and coordinate the shop drawings, identified as "Working Plans", with the Mechanical Engineer and other parts of the work, prior to submission to Architect for review.

B. Architect will review for concept only. Contractor/Installer and mechanical shall review for possible conflict with other portions of the work.

3.09 HYDROSTATIC TESTS

A. All new systems including yard piping shall be hydrostatically tested at not less than 200 psi pressure for 2 hours, or at 50 PSI in-excess of the maximum pressure, when the maximum pressure to be maintained in the system is in-excess of 150 PSI.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Project specification Sections, apply to this and the other sections of Division 22.

B. This Division is an integrated whole comprising interrelated and interdependent Section and shall be considered in its entirety in determining requirements of the Work.

C. Refer to other sections of this Division for additional requirements or information regarding the subjects of this Section.

1.02 SECTION INCLUDES

A. This Section includes general administrative and procedural requirements for Plumbing installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:
   1. Submittals.
   2. Coordination drawings.
   3. Record documents.
   4. Maintenance manuals.
   5. Rough-in.
   6. Mechanical installations.
   7. Cutting and patching.

1.03 SUBMITTALS

A. General: Follow the procedures specified in Division 01.

B. Plumbing submittals shall include shop drawings, product data, and samples per requirements of each section of specification

C. Plumbing Submittals and Product Data: Assemble “submittals” and “product data” into tabbed brochures according to main areas of work.
   1. Assemble each brochure with tabbed separators for each Specification Section where products are noted to be submitted, with separate tabs for each product listed.
   2. For items such as valves, hangers, and accessories, indicate specific items and where they are to be used.
   3. Contractor need only to submit for review those items specified to be submitted, unless requested by the Architect for special review.

D. All submittals shall be submitted in hard copy, electronic submittals are not acceptable.

E. Increase the number of Plumbing related submittals including shop drawings, product data, and samples submitted to allow for required distribution by one additional copy, which will be retained by the Mechanical Consulting Engineer.

F. Submit for review, only the specific items required in this Section or other Sections of Division 22.

G. Additional submittals shall include, but not limited:
   1. Air balance reports and equipment data record drawings.
   2. Certification of completion of testing.
   3. Certification of completion of operation instructions.
   4. Operating instruction brochure.
   5. Maintenance instruction brochures.
   6. Equipment guarantees.
   7. 1/4" = 1'-0" or larger scale layouts of "Equivalent" equipment or "Or Approved Equal" equipment.
   8. Coordination Drawings, where requested or required.

H. Submittal materials will be reviewed for substantial conformity with the intent of the contract plans and specifications only. Such review does not indicate approval of dimensions, quantities, coordination with other trades, or work methods of the contractor, which are indicated thereon.

I. Additional copies may be required by individual sections of these specifications.

1.04 COORDINATION

A. The Contractor shall be totally responsible for coordinating the layout of all building elements to avoid conflict of the work of the structural, mechanical, electrical systems, and architectural features of the building.

B. The cost of any extra work of any kind caused by a conflict due to this lack of coordination shall be borne by the Contractor.

1.05 COORDINATION OF DRAWINGS

A. Prepare coordination drawings in accordance with requirements of Project Specification to a scale of 1/4" = 1'-0" or larger; detailing major elements, components, required clearances, and systems of Plumbing equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of the installations are of importance to the efficient flow of the Work, including but not necessarily limited to the following:
   1. Indicate the proposed locations of piping, ductwork, equipment, and materials. Include the following:
      a. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
      b. Equipment for connections and support details.
   2. Prepare reflected ceiling plans to coordinate and integrate installations with other systems and components, such as, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

B. Submittal of "Or Equal" substitutions of equipment will not be reviewed unless accompanied by coordination drawings.

1.06 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements of project specification. In addition to the requirements of project specification, indicate the following installed conditions:
   1. Record drawings of all installed as specified in Division 01 the locations and invert elevations of underground installations.

1.07 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Project specification and Division 23 Section "Supplementary HVAC Requirements."

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, mill certification, and other information needed for identification.

1.09 EQUIVALENT EQUIPMENT

A. In these specification and drawings, whenever more than one (1) manufacturer's product is specified, the manufacturer specified on the drawings and the first named product in these specifications is the basis of design and the use of alternate-named manufacturer's product or substitutes may require modification in the design work and agency approvals. If such alternatives or substitutions are proposed by the contractor, contractor shall adhere to the following requirements:
   1. Contractor shall clearly identify all proposed alternatives or substitutions in the submittal package.

2. The Contractor shall assume all costs required to make all necessary revisions and modifications of the contract documents resulting from the substitution or selection of an alternate manufacturer's product, including all professional fees and the cost of DSA approval.
3. The Contractor shall assume all costs required for any additional modification to building structure, electrical and all other related construction costs resulting from the substitution or selection of an alternate manufacturer's product.

B. These specifications and/or drawings, names and specifies certain equipment in detail which are the basis of design and are explained in paragraph 1.09-A above. It also names alternate equipment by manufacturer, which is not considered to be a "substitution."

C. Submit equivalent equipment to the Architect for review per the requirements of Division 01, and Section "Common Work Results for Plumbing."

D. Equipment of Manufacturers named in Division 22 will be considered equivalent to that specified in detail and/or named on the drawings if:
1. The proposed equipment is of equivalent quality, capacity.
2. Equipment is as fully equipped, fits the space allotted, and has physical configuration and weight similar-to the equipment specified in detail.

E. A complete lay out of an equipment room or area must be submitted for equivalent equipment. Notice space limitations. Layouts to include plans and section views at a scale of not less than 1/4" = 1 ft.

F. The Architect shall determine the acceptability of "Equivalent Equipment."

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 ROUGH-IN

A. Verify final locations for rough-in with field measurements and with the requirements of the actual equipment to be connected.

3.02 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of Plumbing systems, materials, and equipment. Comply with the following requirements:
1. Coordinate Plumbing systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for Plumbing installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of Plumbing materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible as required by California Building Code.
7. Coordinate connection of Plumbing system with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect prior to commencement of installation.

9. Install systems, materials, and equipment level and plumb, parallel, and perpendicular to other building systems and components.
10. Install all Plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components in full compliance with California Building Code and the equipment manufacturer's recommendations. If the drawings or the manufacturer does not provide a specific space requirement for servicing equipment, provide as a minimum, horizontal distance of 36" from face of equipment to opposite vertical surface.
11. Install access panels or doors for all equipment and components which require access for adjustment and maintenance, where units are concealed behind finished surfaces.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Any equipment located above a ceiling that has any component, which is serviceable shall be installed within 12" of the top-of the ceiling.

3.03 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with project specification. In addition to the requirements specified in project specification, the following requirements apply:
   1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of Plumbing equipment and materials required to:
   1. Uncover Work to provide for installation of ill-timed Work.
   2. Remove and replace defective work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.
   5. Install equipment and materials in existing structures.
   6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

C. Cut, remove, and legally dispose of selected Plumbing equipment, components, and materials as indicated, including but not limited to removal of Plumbing piping, refrigerant lines, heating units, and other Plumbing items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
   1. Patch existing finished surfaces and building components using experienced installers and new materials matching existing materials. For installer’s qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION

SECTION 22 05 11

SUPPLEMENTARY PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies supplementary requirements for Plumbing installations and includes requirements common to more than one section of Division 22. It expands and supplements the requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

1.02 DESCRIPTION

A. Provide a complete and operable installation, including all labor, supervision, materials, equipment, tools, apparatus, transportation, warehousing, rigging, scaffolding and other equipment and services necessary to accomplish the work in accordance with the intent and meaning of these drawings and specifications.

1.03 COORDINATION

A. Coordination of the work is the responsibility of the Contractor.

B. Contractor shall designate an individual competent and versed in the Plumbing trades to coordinate the Plumbing work with the work of other trades.

1.04 DEFINITIONS (AS USED ON DIVISION 22 DRAWINGS AND HEREIN)

A. "Provide" means furnish, install, and connect unless otherwise described in specific instances.

B. "Piping" means pipes, fittings, valves, and all like pipe accessories connected thereto.

C. "Extend", "Submit", "Repair" and similar words mean that the Contractor (or his designated subcontractor) shall accomplish the action described.

D. "Codes" or "Code" means all codes, laws, statutes, rules, regulations, ordinances, orders, decrees, and other requirements of all legally constituted authorities and public utility franchise holders having jurisdiction.

E. "Products", "Materials" and "Equipment" are used interchangeably and mean materials, fixtures, equipment, accessories, etc.

F. "Utility Areas" are defined as mechanical, electrical, janitorial, and similar rooms or spaces which are normally used or occupied only by custodial or maintenance personnel. "Public Areas" are defined as the rooms or spaces, which are not included in the utility areas definition.

G. "Building Boundary" includes concrete walkways immediately adjacent to the building structure.

H. "Below Grade" means buried in the ground.

I. "Substantial Completion" means all components of all systems are functioning but lacking in final adjustment.

J. Pressure rating specified (such as for valves and the like) means design working pressure for and with references to the fluid, which the device will serve.

1.05 RELATED WORK

A. Coordination: Refer to Architectural, HVAC, Plumbing, Civil, Structural, and Electrical Drawings for the construction details and coordinate the work of this Division with that of other Divisions. Order the work of this Division so that progress will harmonize with that of other Divisions and all work will proceed expeditiously. The work of this Division shall include direct responsibility for the correct placing and connection of Plumbing work in relation to the work of other Divisions.

B. Examine other Divisions for work related to the Work of this Division, especially Divisions 22 & 26.

1.06 EXISTING CONDITIONS

A. Visit the site prior to bidding and investigate the existing conditions, which affect or will be affected by the work of this Division. Become thoroughly familiar with the working conditions and take into-account any special or unusual features peculiar to this job. By the act of submitting a Bid, the Contractor will be deemed to have complied with the foregoing, to have accepted such conditions, and to have made allowance therefore in preparing his Bid.

B. The locations of existing concealed utility lines are shown in accordance with reference data received by the Architect. The Architect does not guarantee the accuracy of such data. The points of connection are therefore approximate, and the Bidder shall include adequate funds in his Bid to cover costs of connection regardless of their exact location.

C. Exercise extreme caution during trenching operations. Repair the damage caused by such operations, to existing utility lines at no cost to the Owner, whether the lines are shown on drawings or not.

1.07 DRAWINGS AND SPECIFICATIONS

A. These drawings and specification do not include necessary components for construction safety.

B. All provisions shall be deemed mandatory except as expressly indicated as optional by the word "may" or "option."

C. Except where dimensioned, the drawings relating to this division are a diagrammatic presentation of the design concept, which indicates the general area where piping and ductwork is to be run. The drawings do not necessarily indicate any, and all offsets and configurations required for coordination with other trades. The contractor is responsible for the correct placing of his work, and the proper location and connection of his work in relation to the work or other trades.

1.08 PERMITS AND INSPECTIONS

A. Obtain, schedule, and pay for permits, licenses, approvals, tests, and inspections required by legally constituted authorities and public utility franchise holders having jurisdiction over the work.

B. Afford the Architect's representative every facility for evaluating the skill and competence of the mechanics and to examine the materials. Concealed work shall be reopened when so directed during his periodic visits.

1.09 CODES AND REGULATIONS

A. By submitting a Bid, Contractor is deemed to represent himself as competent to accomplish the work of this Division in conformance with applicable Codes. In case of conflict between the Contract Documents and Code requirements, the Codes shall take precedence. Should such conflicts appear, cease work on the parts of the contract affected and immediately notify the Architect in writing. It shall be the Contractor's responsibility to correct, at no cost to the Owner, any work he executes in violation of Code requirements. Specific references to codes elsewhere in this Division are either to aid the Contractor in locating applicable information or to deny him permission to use options, which are permitted by Codes.

B. Applicable Codes: (Current editions unless otherwise noted)
   1. All local codes; city and/or county as applicable.
   2. OSHA requirements.
   3. California Building Code.
   4. California Code of Regulations (CCR) Titles (as applicable).
   5. Fire Marshal Regulations.
   6. State, County, City Health Department Ordinances and Regulations.
   7. Regulations of all other authorities having jurisdiction.
   8. California Mechanical Code.
   9. California Plumbing Code.

C. Where conflict or variation exists amongst Codes, the most stringent shall govern.

1.10 RECORD AND DOCUMENTATION

A. Accumulate the following and deliver to the Owner's representative prior to final acceptance of the work.
   1. Record (As-Built) Drawings:
      a. Maintain in good order in the field office a complete set of prints for all work being done under Division 22. Update the drawings daily with neat and legible annotations in red ink showing the work as actually installed.
      b. The actual size, location and elevation of all buried lines, valve boxes, manholes, monuments, and stub-outs shall be accurately located and dimensioned from building walls or other permanent landmarks.
      c. Furnish the original marked up AS-Built drawings and an electronic copy in AutoCAD-14 format.
   2. Operation and Maintenance Manual: Furnish an operation and maintenance manual covering the stipulated Plumbing systems and equipment. Seven copies of the manual, bond in hardback binders or an approved equivalent shall be provided to the Architect.
   3. Furnish one complete manual prior to the time that system or equipment tests are performed.
   4. Furnish the remaining manuals before the contract is completed.
   5. The following identification shall be inscribed on the cover:

      OPERATION AND MAINTENANCE MANUAL

      PROJECT TITLE . . . . . .

      CONTRACTOR NAME & CONTACT INFORMATION

   6. Provide a Table of Contents.
      a. Insert tab sheets to identify discrete subjects.
      b. Instruction sheets shall be legible and easily understood, with large sheets of drawings folded in.
      c. The manual shall be complete in all respects for all materials, piping, valves, devices and equipment, controls, accessories, and appurtenances stipulated. Include as a minimum the following:
         1) Updated approved materials lists, shop drawings and catalog information of all items of Plumbing system equipment.
         2) System layout showing piping, valves, and controls.
         3) Wiring and control diagrams with data to explain detailed operation and control of each component.
         4) A control sequence describing start-up, operation, and shutdown.
         5) Detailed description of the function of each principal component of the system.
         6) Procedure for starting.
         7) Procedure for operating.
         8) Shut-down instructions.
         9) Installation instructions.
         10) Adjustments, maintenance, and overhaul instructions.
         11) Lubrication schedule including type, grade, temperature range and frequency.
         12) Safety precautions, diagrams, and illustrations.
         13) Test procedures.
         14) Performance data.
         15) Parts list, with manufacturer's names and catalog numbers.
         16) Preventive maintenance schedule.
         17) Service organization with name, address, and telephone number.
         18) Valve identification chart and schedule.
         19) ASME certificates.

B. Standards Compliance: Where equipment or materials are specified to conform to requirements of standards of recognized technical or industrial organizations such as American National Standards Institute (ANSI) American Society for Mechanical Engineers (ASME) American Society for Testing Materials (ASTM), Underwriters Laboratories (UL), American Gas Association (AGA), American Refrigeration Institute (ARI), or National Electrical Manufacturer's Association (NEMA), that use a label or published listing as a method of indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence.

C. Certificates of Conformance or Compliance: Submit original and not pre-printed certifications. Do not make statements in the certifications that could be interpreted to imply that the product does not meet all requirements.

D. Certified Test Reports: Certified Test Reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use. Before delivery of materials and equipment, submit certified copies of test reports specified in the individual sections.

E. Factory Tests: Factory tests are tests, which are required to be performed on the actual materials or equipment, proposed for use. Submit results of the tests in accordance with the requirements for laboratory test results of this Contract.

F. Permits and Certificates of Inspection: Furnish the originals.

G. Testing procedures and test results required in this and other sections. Furnish 2 copies.

H. Other data required by other sections of this Division. Furnish 2 copies.

1.11 CONSTRUCTION COST BREAKDOWN

A. Prepare and submit for review a construction cost breakdown for the major subdivisions of the Plumbing work in accordance with General and Supplemental Conditions and Project Specification.

B. Subdivide each item on the breakdown into two headings: labor and materials. Include overhead and profit in each entry.

C. Submit one copy of the breakdown directly to the Engineer and the remaining copies sent through regular channels.

1.12 TOOLS

A. Provide all special tools needed for proper operation and routine adjustment and maintenance of systems and equipment. Deliver tools to Owner's representative and request a receipt for same.

1.13 WARRANTIES

A. Refer to Project Specification for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Where periods more than one year are specified in the specifications, such longer periods shall govern. However, when any component fails at any time during this period, the warranty period for such component and all other components, which are inactive because of, said failure shall be suspended. The warranty period for such components shall resume to-run for the remaining portion of the warranty period when failed component is completely repaired and in operation; however, in no case shall the resumed portion of the warranty period be less than 3 months in duration.

C. Neither payment for work, nor total or partial occupancy of work by the Owner, within or prior to the warranty period specified, shall be construed as acceptance of faulty work, or shall condone any negligence or omission of Contractor in doing the work.

D. Compile and assemble the warranties specified in Division 22, into a separated set of vinyl covered, three ring binders, tabulated, and indexed for easy reference.

E. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names and addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.14 SEISMIC RESTRAINT

A. Provide seismic restraint for Plumbing equipment, piping, and ductwork.

B. Contractor shall submit certification of suitability of seismic restraint methods signed by Licensed Structural Engineer registered in State of California.

1.15 SYSTEM OPERATIONAL TESTS

A. The Contractor shall inform the Owner one week prior to start of testing in order that the Owner's representative may be present.

B. After balancing and prior to final inspection, the contractor shall operate all systems continuously trouble free and stable for a minimum period of fourteen (14) consecutive days including Saturday and Sunday. Each day shall be a minimum of an 8-hour day. Should a problem arise, the fourteen (14) day period shall be restarted and repeated until successfully operated for full 14 days. A written report certified by the Owner's representative shall indicate the successful completion of a stable and trouble free 14-day period.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Standard Products: Materials and equipment shall be essentially the standard cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be their latest standard designs that comply with the specification requirements.

B. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening unless more stringent requirements are specified. Where two or more units of the same type of equipment are required, these units shall be products of a single manufacturer. The components thereof, however, are not required to be exclusively of the same manufacturer.

C. Each major component of equipment shall have manufacturer's name, address, model, and serial number on a nameplate securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

D. In these specification and drawings, whenever more than one (1) manufacturer’s product is specified, the manufacturer specified on the drawings and the first named product in these specifications is the basis of design and the use of alternate-named manufacturer’s product or substitutes shall comply with the requirements of Section 22 05 00.

2.02 PRODUCT LISTING

A. When two or more items of same material or equipment are required (pipe and fittings, pumps, valves, air conditioning units, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, sheet metal, wire, steel bar stock, welding rods, solder, fasteners, and similar items used in Work, except as otherwise indicated.

2.03 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated Plumbing equipment, indicating manufacturer, product name, model name, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

2.04 SUBSTITUTIONS

A. General: Submittals of "Substitutions" shall be in accordance with requirements of Division 01.

B. By proposing a-substitution it is deemed that the Contractor shall bear the cost of any, and all design and construction changes (whether architectural, structural, electrical, HVAC and Plumbing) necessary to accommodate the substitution, if said substitution is accepted.

C. Specific: Refer to Specification Sections 22 05 00 & 22 05 12 for additional requirements.

2.05 SUBMITTALS

A. General: Make submittals in accordance with requirements of Division 01.

B. Specific: Refer to Specification Sections 22 05 00 for additional requirements.

PART 3 - EXECUTION

3.01 WORKMANSHIP AND INSTALLATION METHODS

A. Workmanship shall be in the best standard practice of the trade.

B. Install equipment in accordance with the manufacturer's instructions and recommendations unless otherwise noted or specified.

3.02 TESTS

A. General:
   1. Demonstrate that all components of the work of this Division have been provided and that they operate in accordance with the Contract Documents.
   2. Provide instruments and personnel for tests and demonstrations. Submit signed test results.

B. Specific: Refer to the other sections of this Division for test requirements.

3.03 DELIVERY, HANDLING, STORAGE OF MATERIALS AND PROTECTION OF WORK

A. Protect materials against dirt, water, chemical and mechanical damages both while in storage and during construction.

B. Cover materials in such a manner that no finished surfaces will be damaged, marred or splattered with plaster or paint, and all moving parts will be kept clean and dry.

C. Keep cabinets and other openings closed to prevent entry of foreign matter.

D. Specific: Refer to other sections of this Division for additional requirements.

3.04 PROJECT CONDITIONS

A. Check and coordinate for clearance, accessibility, and placement of equipment either by going through openings provided or by placing equipment during construction. Ordering of equipment to be shipped disassembled, or disassembly of equipment at Project Site and reassembly of equipment to accomplish this requirement shall be executed without additional cost. Where provided openings are inadequate to accommodate equipment, provide new openings and restoration of same, all at no additional cost. Obtain written approval for new openings before proceeding.

B. Verify location of all equipment within finished spaces with the Architectural Drawings. In the event, that Plumbing drawings do not indicate exact locations, or are in conflict, with the Architectural drawings, obtain information regarding proper locations. Installation of work without proper instruction under such circumstances will result in relocation of work, when directed, without additional cost.

3.05 INSTRUCTION TO OWNER PERSONNEL

A. Contractor shall furnish, without additional expense to the Owner, the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the equipment or system specified. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance of work. Instruction shall be given at the Owner's convenience. The number of man-days (eight-hours) of instruction furnished shall be as specified in other sections. When more than four man-days of instruction are specified, approximately half of the time shall be used for classroom instruction. All other time shall be used for instruction with the equipment or system. When significant changes or modifications are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.

B. Contractor shall videotape, both visual and audio, instruction to Owner's personnel on the maintenance and operation of the Plumbing systems.

C. Submit certification, signed by Owner's agent that instructions have been completed and the videotape has been reviewed and delivered to the Owner.

D. Printed operating instructions and a copy of wiring diagrams are to be mounted in all equipment areas, framed and behind glass or encased in plastic. Printed operating instructions shall include steps for starting up and securing equipment. As a precedent to final acceptance four (4) copies of instructions are to be submitted to the Architect for review. Contractor shall turn over to Owner in a neat brochure form, equipment-guarantee, and maintenance instructions.

3.06 CLEANING

A. Cleaning shall be done as the work proceeds. Periodically remove waste and debris to keep the site as clean as is practical.

B. Refer the Division 01 for general requirements for cleaning.

C. Leave exposed parts of the Plumbing work in a neat, clean, and usable condition, with painted surfaces unblemished and plated metal surfaces polished.

D. Thoroughly clean all materials, equipment, and appliances. Clean and prepare all surfaces to be painted. Clean the entire premises of unused materials, debris, spots, and marks to the satisfaction of the Architect.

E. Remove, thoroughly clean, and replace all strainers and automatic valves after the system has been put in operation until system is clear of all foreign matter and repeat this operation after ten (10) days and again after the system has been in operation thirty (30) days. Submit certification that this operation has been completed.

3.07 SAFETY REQUIREMENTS

A. Enclose and guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts in accordance with OSHA requirements. Insulate, guard, and cover any high-temperature equipment and piping so located as to endanger personnel or create a fire hazard.

END OF SECTION

SECTION 22 05 12
PLUMBING PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for handling requests made after award of the Contract for substitutions of products specified in Division 22.

1.02 RELATED SECTIONS

A. Procedure for Contractor's construction Schedule and the Schedule of Submittals are included under Division 01.

B. Standards: Refer to Division 01 for applicability of industry standards to products specified.

C. Procedural requirements governing the Contractor's selection of products and product options are included under Division 01.

D. Refer to Division 01 for Products and Substitutions.

E. Refer to Sections 22 05 00 & 22 05 11 for additional requirements.

1.03 DEFINITIONS

A. "Products" is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. "Materials" is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work.

B. "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in contract documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

1.04 SUBSTITUTIONS

A. The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to contract documents, where requested by Owner, Architect or Engineer, are "changes" not "substitutions". Substitutions requested during bidding period, which have been accepted prior to Contract Date, are included in contract document and are not subject to requirements for substitutions as specified herein. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions"; and do not constitute a basis for change orders, except as provided for in contract documents. Otherwise, contractor's requests of changes in products, materials and methods of construction required by contract documents are considered requests for "substitutions" and are subject to requirements hereof.

B. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise, requests will be returned without action except to record noncompliance with these requirements.
   1. Extensive revisions to Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of Contract Documents.
   3. The request is directly related to an "or approved equal" clause or similar language in the Contract Documents.
   4. All costs required to make all necessary revisions and modifications to the contract documents resulting from the substitution, including but not limited to, all professional fees and the cost of DSA approval will be the Contractor’s responsibility.
   5. All costs required to make all necessary revisions and modifications to the building structure, electrical and all other related construction costs resulting from the substitution,

including but not limited to, material, products, equipment, testing, and inspection will be the Contractor's responsibility.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.
8. Contractor certifies that the substitution is not heavier than the specified item and does not necessitate any structural and electrical redesign; will fit within the room or area designed for the specified item; and will not exceed any maximum dimensions specified or shown on the original contract Documents.
9. All roof mounted equipment must be less than or equal to the maximum height dimension from the finished roof as shown on the drawings.
10. Contractor represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
11. Contractor represents that he will provide the same warranty for the substitution that he would for that specified.

1.05 SUBMITTALS

A. Requests for Substitutions: Any request for substitution shall follow the guidelines of Substitution Requirements in Division 01, Section 22 05 00 & 22 05 11.

B. Substitution Warranty: All submittals of Request for Substitutions under the General and Supplementary Conditions of this Section shall be accompanied by a completely executed (filled out) and signed Substitution Warranty in the form entitled "Substitution Warranty", bound herein. Substitutions will not be accepted without the Substitution Warranty. In addition to other requirements, Contractor shall warrant in writing on his own letterhead that substituted materials shall perform as specified, and assume complete responsibility for same, including responsibility and costs required for modifications to building or other materials or equipment, and any additional coordination with work of other trades. Testing, if required, shall be paid by Contractor.

C. Responsibility of Contractor: The contractor shall be solely and directly responsible for fitting accepted substitute material and equipment into the available space in a manner acceptable to the Architect, and for the proper operation of the substituted equipment with all other equipment with which it may be associated. The Contractor shall bear all costs of meeting the above requirements for presenting a proposed substitution, and if the substitution is accepted, he must bear all costs involved.

D. Submit the following as part of the Request for Substitutions:
   1. Data showing proposed equipment is "equal" to that specified and is fully equipped, fits the space allotted and has physical configuration and weight similar-to the equipment specified in detail.
   2. A complete layout, where applicable, of equipment room or area must be submitted for equipment proposed in "Request for Substitution". Submittal shall conform to requirements of Division 01 and Section 22 05 00 "Common Work Results for Plumbing" as it applies to "Coordination Drawings."
   3. Seismic Restraint: Where seismic restraint is required for products or equipment as specified, methods of seismic restraint signed by licensed Structural Engineer registered in the State of California, shall be submitted for review to the Division of the State Architect.

1.06 ARCHITECT'S ACTION

A. The Architect may request additional information or documentation necessary for evaluation of the request. Requests, by the Architect, for additional information or documentation will be in accordance with Division 01 requirements. The Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, Contractor shall use the “Bases of Design” product specified by name in the contract documents. Acceptance will be in the form of a Change Order.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions shall conform to the product requirements for the specified products or equipment.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SAMPLE

S U B S T I T U T I O N S W A R R A N T Y

In addition to other requirements, Contractor shall warrant in writing that substituted materials shall perform as specified, and assume complete responsibility for same, including responsibility and costs required for modifications to building or other materials or equipment, and any additional coordination with work of other trades. Testing, if required, shall be paid by contractor. The following is an example of the type Substitution Warranty which shall be executed by the Contractor, on his own letterhead:

SUBSTITUTION WARRANTY
We propose to provide

_____
(Describe items being proposed for substitution)

for_____ in lieu of
(List project name)

as indicated on the drawings and described in Section _____ of the Specifications.

We agree to assume the cost of any, and all modifications to the Contract Documents and to other portions of the work as indicated in the Specification Sections 23 05 00, 23 05 11, & 23 05 12, and as necessary to accommodate for substituted material(s) and system(s) as indicated in this letter of “Substitution Warranty”.

We hereby warrant that _____
(Provide Description)

is the equivalent of _____
(Specified Product)

in every respect and will perform satisfactorily under the conditions and use indicated on the Drawings and described in the Specifications.

Signed: _____ Date: _____
(Manufacturer/Supplier)

Signed: _____ Date: _____
(Subcontractor)

Signed: _____ Date: _____
(Contractor)

NOTE: Affix Corporate Seal over Signatures.

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the basic requirements for electrical components, which are an integral part of packaged Plumbing equipment. These components include, but are not limited to factory-installed motors, starters, and disconnect switches furnished as an integral part of packaged Plumbing equipment.

B. Specific electrical requirements (i.e., horsepower and electrical characteristics) for Plumbing equipment are scheduled on Drawings.

C. All motors, power driven equipment and automatic control equipment, except motor starters as hereinafter set forth required and connected with the work of this section of the specifications are to be furnished and installed under Division 22.

D. Control low (24V) and control line (120V) voltage wiring, conduit and related switches and relays required for the automatic control and/or interlock of motors and equipment includes final connection, are to be furnished and installed under Division 22. Materials and installation to conform to Class 1 or 2, CAC Title 24, Article E725, and as restricted under Division 26 of these specifications.

E. Power wiring, conduit, outlets, disconnect switches, motor starters and motor-rated contactors, and making of final connections, except as hereinafter specified, are to be furnished and installed under the Division 26 of these Specification.

F. Identify circuits and equipment as outlined in the Electrical Sections of these Specifications.

G. Coordinate requirements for underground conduit only between buildings for control interlocks shown on the drawings. This conduit to be furnished and installed under Division 26 of these Specifications.

H. Space provisions have been made on electrical panels for control power source.

1.02 RELATED SECTIONS

A. Separate electrical components and materials required for field installation and electrical connections are specified in Division 26.

B. This section applies to all Division 22 sections specifying Plumbing equipment.

1.03 REFERENCES

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. Comply with National Electrical Code (NFPA 70).

1.04 SUBMITTALS

A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.05 QUALITY ASSURANCE

A. Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.01 MOTORS

A. Provide all motors necessary for equipment under the Plumbing Work. See Electrical Drawings for voltage and phase of electrical services.

B. The following are basis requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
   1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
   2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
   3. 2-speed motors shall have 2 separate windings on poly-phase motors.
   4. Temperature Rating: As a minimum, motors shall be rated for 40 degree C environment with maximum 50 degree C temperature rise for continuous duty at full load (Class A Insulation).
   5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
   6. Service Factor: 1.23 for poly-phase motors and 1.35 for single-phase motors.
   7. Motor construction: NEMA Standard MG 1, general purpose, continuous duty, deign "B", except "C" where required for high starting torque.
      a. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
      b. Bearings:
         1) Ball or roller bearings with inner and outer shaft seals.
         2) Re-greasable bearings, except permanently sealed where motor is normally inaccessible for regular maintenance.
         3) Bearings designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
         4) Bearings for fractional horsepower, light duty motors, sleeve type bearings are permitted.
      c. Enclosure Type:
         1) Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
         2) Guarded drip-proof motors where exposed to contact by employees or building occupants.
         3) Weather protected Type I for outdoor use, Type II where not housed (Epoxy encapsulated or TEFC).
      d. Overload protection: Polyphase built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter. Single phase, provide thermal overload protection.
      e. Noise rating: "Quiet".
      f. Efficiencies shall be guaranteed minimum values in accordance with the following tabulation. Efficiencies shall be established in accordance with NEMA Test Standards MG1-12.53A using IEEE Test Procedure 112, Method B:

HP	EFFICIENCY
1 - 2	81.5
3 – 5	86.5
7-1/2 - 10	90.6
15 - 30	92.0

      g. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
      h. Provide all motors with junction boxes or terminals boxes and provide adjustable slide rails for all motors with belt drives.

i. Motors rated 1 HP and larger shall have shaft, bearings and, etc. capable of operating with multiple grooved sheaves and two or more belts.
j. V Type Belt Drives: Drives requiring not more than 2 belts; variable pitch type; size for mid-point of operating range. Drives requiring 3 or more belts; nonadjustable constant speed type. Provide belts in matched sets.

2.02 MOTOR STARTERS

A. Unless provided as part of packaged Plumbing equipment or otherwise indicated, starters for motors will be provided under Division 26. Provide to Division 26 the data necessary for motor starter heater sizing for all motors.

B. Starters for factory Plumbing equipment specified under Division 22 shall be provided as part of the package.

C. Motor Starter Characteristics:
1. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations, which shall have NEC proper class and division.
2. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.

D. Manual switches shall have:
1. Pilot lights and extra positions for multi-speed motors.
2. Overload protection: melting alloy type thermal overload relays.

E. Magnetic Starters:
1. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
2. Trip-free thermal overload relays, each phase.
3. Interlocks, switches, and similar devices as required for coordination with control requirements.
4. Built-in control circuit transformer, fused from line side, where service exceeds 240 volts.
5. Externally operated manual reset.
6. Under-voltage release or protection.

F. Motor Connections:
1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

2.03 DISCONNECT SWITCHES

A. When applied as part of factory furnished and mounted equipment, disconnects shall meet the requirements for disconnect switches set forth in Division 26.

PART 3 - EXECUTION

3.01 SEISMIC RESTRAINT

A. All electrical devices shall be seismically restrained.

END OF SECTION

SECTION 22 05 15
ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes limited scope of general construction materials and methods for access doors and panels in walls and ceilings for access to Plumbing materials.

B. Requirements of access doors are outlined in Division 08.

C. Access doors and panels are required for all Plumbing equipment requiring maintenance, inspection, adjustment, monitoring, etc… which are installed in inaccessible areas such as behind walls, above ceiling, under floor, etc.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of access door or panel.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer Qualifications: Engage an experienced Installer for the installation of access panels and doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
   1. Elmdor / Stoneman.
   2. Jay R. Smith Mfg. Co.
   3. Milcor Inc.

2.02 ACCESS DOORS

A. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation.

B. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

C. Frames: 16-gage steel, with a 1-inch-wide exposed perimeter flange.
   1. For installation in masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
   2. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
   3. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter frame.

D. Flush Panel Doors: 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
   1. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

E. Locking Devices: Flush, screwdriver-operated cam locks.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which access door and panel products are to be installed. Do not proceed with work until unsatisfactory conditions have been in manner acceptable to Installer.

3.02 APPLICATION

A. Nonrated Walls and Ceilings: Prime coat finish door and frame, Allen key latch face of wall type; Smith 4760, Elmdor / Stoneman DW Series.

B. Fire Rated Walls and Ceilings: "B" Labeled U.L. 1-1/2 hours, prime coat finish door and frame, flush keyed cylinder lock; Milcor.

C. Tile Walls: Cover and frame 18-8 satin stainless steel, face-of-wall type, vandal resistant screws; J. R. Smith 4762, Elmdor / Stoneman DW Series.

3.03 INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.

3.04 COORDINATION

A. General: Coordinate locations of ceilings access doors with lights, air outlets, speakers, etc. Submit drawings showing relative locations of doors to other ceiling items for acceptance by the Architect prior to installation. Transparencies of floor plans and/or reflected ceiling plans will be available from the Architect for this purpose.

B. Location: Doors may be located to serve more than one item where feasible, providing they are approved as specified. Sizes suitable for purpose intended, with 12" x 12" minimum.

C. Access doors and panels not required in accessible ceiling systems where direct access to HVAC items is possible.

END OF SECTION

SECTION 22 05 23

GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes general duty valves common to most mechanical piping systems.
   1. Special purpose valves are specified in individual piping system specifications.

1.02 RELATED SECTIONS

A. Division 22 Section "Plumbing Identification" for valve tags and charts.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract, Division 01 Specification Sections, and Section 22 05 00 "Common Work Results for Plumbing."
   1. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.
   2. Provide valve schedule showing manufacturer's figure number and sizes.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Comply with the requirements specified in Division 01 Section "Materials and Equipment," under "Source Limitations."

B. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

C. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance): Comply with the various MSS Standard Practices referenced.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Preparation For Transport: Prepare valves for shipping as follows:
   1. Ensure valves are dry and internally protected against rust and corrosion.
   2. Protect valve ends against damage to threads, flange faces, and weld-end preps.
   3. Set valves in best position for handling. Set globe and gate valves closed to prevent ratting; set ball and plug valves open to minimize exposure of functional surfaces; and block swing check valves in either closed or open position.

B. Storage: Use the following precautions during storage:
   1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed in valve schedule.

2.02 VALVE FEATURES, GENERAL

A. Valve Design: Rising stem or rising outside screw and yoke stems.
   1. Non-rising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

C. Sizes: Same size as upstream pipe, unless otherwise indicated.

D. Operators: Provide the following special operator features:
   1. Hand wheels, fastened to valve stem, for valves other than quarter turn.
   2. Lever handles, on quarter-turn valves 6-inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.
   3. Chain-wheel operators, for valves 2-1/2 inch and larger, install 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
   4. Gear drive operators, on quarter-turn valves 8-inch and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. End Connections: As indicated in the valve specifications.
   1. Threads: Comply with ANSI B1.20.1.
   2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
   3. Solder-Joint: Comply with ANSI B16.18.
      a. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg. F for gate, globe, and check valves; below 421 deg. F for ball valves.

2.03 GATE VALVES

A. Gate Valves, 2-Inch and Smaller: MSS SP-80; Class 150, body and union bonnet of ASTM B62 cast bronze; with threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron hand wheel. Do not use solder end valves for hot water heating or steam piping applications.

MANUFACTURER	THREADED NRS	THREADED RS	SOLDER NRS	SOLDER RS
Crane	X	431UB	X	X
Grinnell	3050	3060	X	X
Milwaukee	1141	1151	X	1169
Nibco	T-136	T-135	S-136	X
KITZ	X	42	X	43

"X" means not available. Provide lead-free products.

B. Gate Valves, 2-1/2 Inch and Larger: MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A126 class B; with flanged ends, "Teflon" impregnated packing, and two-piece backing gland assembly.

MANUFACTURER	OS & Y RS	NRS
Crane	465-1/2	461
Grinnell	6020A	6060A
Nibco	617-O	F-619
Milwaukee	F-2885	F-2882
KITZ	72	75

"X" means not available. Provide lead-free products.

2.04 BALL VALVES

A. Ball Valves, 2 Inches and Smaller: Rated for 150 psi saturated stem pressure, 400 psi WOG pressure; two- or three-piece construction; with bronze body conforming to ASTM B 62, full port only, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service; threaded ends for heating hot water and low-pressure steam.

1. Ball Valves - 1 Inch and Smaller:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Crane	9302	9322
Nibco	T-580-70	S-580-70
Watts	B-6000	B-6001
Milwaukee	BA-100	BA-150
KITZ	58	59

"X" means not available. Provide lead-free products.

2. Ball Valves - 1-1/4 Inch to 2 Inch:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Nibco	T-590-Y	S-590-Y
Stockham	S-216 BR-R-T	S-216-BR-R-S
Watts	B-6800	B-6801
KITZ	62	63

"X" means not available. Provide lead-free products. Grooved Ends: Victaulic Style 721.

2.05 PLUG VALVES

A. Plug Valves, 2-Inch and Smaller: Rated at 150 psi WOG; bronze body, with straightaway pattern, square head, and threaded ends.
   1. Lunkenheimer: 454 or equal.
   2. Homestead: 611 (Semi Steel Body) or equal.

B. Plug Valves, 2-1/2 Inch and Larger: MSS SP-78; rated at 175 psi WOG; lubricated plug type, with semi steel body, single gland, wrench operated and flanged ends.
   1. Powell: 2201 or equal.
   2. Homestead: 605 or equal.

2.06 CHECK VALVES

A. Swing Check Valves, 2-Inch and Smaller: MSS SP-80; Class 125, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.

MANUFACTURER	CLASS 125THREADED ENDS	CLASS 125SOLDER ENDS	CLASS 125THREADED ENDS
Crane	37	1342	137
Milwaukee	509	1509	510
Nibco	T-413	S-413	T-433
KITZ	22	23	29

Grooved Ends: Victaulic Series 712. Provide lead-free products.

B. Swing Check Valves, 2-1/2 Inch and Larger: MSS SP-71; Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal wing, and bronze disc or cast-iron disc with bronze disc ring; and flanged ends. Provide valves capable of being refitted while the valve remains in the line.

MANUFACTURER	CLASS 125	CLASS 175
Crane	373	X
Milwaukee	F2974	X
Nibco	F-918	X
KITZ	78	X

"X" means not available. Provide lead-free products.

C. Lift Check Valves, 2-Inch and Smaller: Class 125; cast-bronze body and cap conforming to ASTM B 62; horizontal or angle pattern, lift-type valve, with stainless steel spring, bronze disc holder with renewable "Teflon" disc, and threaded ends. Provide valves capable of being refitted and ground while the valve remains in the line.

MANUFACTURER	HORIZONTAL	ANGLE
Jenkins	655-A	X
Lunkenheimer	233	X

"X" means not available. Provide lead-free products.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine valve interior through the end ports for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks used to prevent disc movement during shipping and handling.

B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the shipping position.

C. Examine threads on both the valve and the mating pipe for form (i.e., out-of-round or local indentation) and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.

F. Replace defective valves with new valves.

3.02 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:
   1. Copper Tube Size, 2-Inch and Smaller: Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
   2. Steel Pipe Sizes, 2-Inch and Smaller: threaded or grooved end.
   3. Steel Pipe Sizes 2-1/2 Inch and Larger: grooved end or flanged.

3.03 VALVE INSTALLATIONS

A. General Application: Refer to piping system specification sections for specific valve applications and arrangements. Use gate, ball, and butterfly valves for shut-off duty. Use globe, plug, and ball valves for throttling duty.

B. Locate valves for easy access and provide separate support where necessary. Where concealed, install behind access panel with valve located for complete accessibility for servicing.

C. Install valves and unions for each fixture and item of equipment. Arrange valves to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install three-valve bypass around each pressure reducing valve using throttling-type valves.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Installation of Check Valves: Install for proper direction of flow as follows:
   1. Swing Check Valves: Horizontal position with hinge pin level.
   2. Lift Check Valve: With stem upright and plumb.

H. Where shut-off valves are installed in a confined space such as in a wall or furring, install ball valves with operating handle parallel with face of wall.

I. Where valves are located in walls, do not install more than 6'-0" from finished floor. Where valves are located above ceilings, install centered on access point and not greater than 24" above access point.

3.04 SOLDER CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open gate and glove valves to full open position.

E. Remove the cap and disc holder of swing check valves having composition discs.

F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

G. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

H. Use 95-5 tin/antimony lead-free solder for all solder joints unless indicated otherwise.

3.05 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.06 FLANGED CONNECTIONS

A. Align flange surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.07 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.08 ADJUSTING AND CLEANING

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

3.09 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

A. Below schedules are for standard installation conditions. Variations or special valves and/or conditions set forth in other Division 15 Sections shall take precedence.

1. VALVES, 2-INCH AND SMALLER

SERVICE	GATE	GLOBE	BALL	CHECK
Condenser Water	125	125	150	125
Chilled Water	125	125	150	125
Domestic Hot and Cold Water	125	125	150	125
Heating Hot Water	150	150	150	150
Low-Pressure Steam	150	150	150	150

2. VALVES, 2-1/2 INCH AND LARGER

SERVICE	GATE	GLOBE	BUTTERFLY	CHECK
Condenser	125	125	200	125
Chilled Water	125	125	200	125
Domestic Hot and Cold Water	125	125	200	125
Heating Hot Water	125	125	200	125
Low-Pressure Steam	125	125	200	125

END OF SECTION

SECTION 22 05 29
SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of supports and anchors required by this section is indicated on drawings or in other Division 22 sections and include the following:
   1. Horizontal-Piping Hangers and Supports.
   2. Vertical-Piping Clamps.
   3. Hanger-Rod Attachments.
   4. Building Attachments.
   5. Saddles and Shields.
   6. Miscellaneous Materials.
   7. Anchors.
   8. Equipment Supports.

1.02 RELATED SECTIONS

A. This section is part of each Division 22 section, making reference to or requiring supports and anchors specified herein.

B. Supports and anchors furnished as part of factory fabricated equipment are specified as part of equipment assembly in other Division 22 sections.

C. Section 03 30 00: Cast-in-Place Concrete.

1.03 QUALITY ASSURANCE

A. Codes and Standards:
   1. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
   2. UL and FM Compliance: Provide products which are UL Listed and FM approved.
   3. MSS Standard Compliance:
      a. Provide pipe hangers and supports of which materials, design, and manufacturer comply with MSS SP-58.
      b. Select and apply pipe hangers and supports, complying with MSS SP-69.
      c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
      d. Terminology used in this section is defined in MSS SP-90.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58.
   1. Components shall have galvanized coatings, where installed for piping and equipment that will not have field-applied finish.
   2. Pipe attachments shall have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal Hanger Shield Inserts: 100 PSI average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

2.02 HORIZONTAL PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. 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 copper-piping systems.
   1. Adjustable Steel Clevis Hangers: MSS Type 1.
   2. Adjustable Swivel Pipe Rings: MSS Type 6.

2.03 VERTICAL PIPING CLAMPS

A. General: Except as otherwise indicated, provide factory fabricated vertical-piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

B. Two-Bolt Riser Clamps: MSS Type 8.

2.04 HANGER ROD AND BUILDING ATTACHMENTS

A. General Hanger Rod Attachment: Refer to structural drawings for requirements of hanger rod and building attachments. If a specific attachment that is required is not detailed on the structural drawings, one of the following attachments may be submitted for review by the structural engineer prior to installation. Except as otherwise indicated, provide factory fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers, and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

B. General Building Attachment: Except as otherwise indicated, provide factory fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
   1. Concrete Inserts: MSS Type 18.
   2. Center Beam Clamps: MSS Type 21.
   3. Steel Beam Clamps W/Eye Nut: MS Type 28.
   4. Linked Steel Clamps W/Eye Nut: MSS Type 29.
   5. Malleable Beam Clamps: MSS Type 30.
   6. Steel Brackets: One of the following for indicated loading:
   7. Light Duty: MSS Type 31.

2.05 SADDLES AND SHIELDS

A. General: Except as otherwise indicated, provide saddles, or shields under piping hangers, and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

B. Protection Shields: MSS Type 40; provide high density insert of same thickness of insulation.

2.06 MANUFACTURERS OF HANGERS AND SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide hangers and supports of one of the following:
   1. B-Line Systems, Inc.
   2. Tolco, Inc.
   3. Elcen Metal Products Co.
   4. Fee & Mason Mfg. Co.; Div. Figgie International.

5. ITT Grinnel Corp.

2.07 MISCELLANEOUS MATERIALS

A. Steel Plates, Shapes and Bars: ASTM A36.

B. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 parts cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

C. Pipe Alignment Guides: Factory fabricated, of cast semisteel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

D. Pipe Roll Stand: Factory fabricated cast iron stand, size as required, with insulation installed on piping.

2.08 ISOLATORS

A. Isolators: Provide factory-fabricated isolators of size required.

B. Spring Isolators: Refer to Section 22 05 48 "Vibration Control for Plumbing."

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine substrates and conditions under which supports, and anchors are to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachment.

B. Prior to installation of hangers, supports, anchors and associated work, installer shall meet at project site with Contractor, installer of each component of associated work, inspection, and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.03 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top of inserts.

3.04 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69.

B. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and type as installed for adjacent similar piping.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

E. Provisions of Movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors.

F. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

G. Pipe Slopes: Install hangers and supports to provide required pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

H. Bare Piping: Install isolators for all bare domestic water and bare hydronic piping.

I. Insulated Piping: Comply with the following installation requirements.
   1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
   2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields. Provide rigid insulation reinforcement at shields.

J. Hangers and supports to be capable to resist the minimum seismic forces indicated in drawings.

3.05 EQUIPMENT SUPPORTS

A. Concrete housekeeping bases will be provided as work of Division 03.

B. Furnish to Contractor, scaled layouts of all required bases, with dimensions of bases, and location to column center lines. Furnish templates, anchor bolts, and accessories, necessary for base construction.

3.06 ADJUSTING AND CLEANING

A. Hanger Adjustment: Adjust hangers so-as to distribute loads equally on attachments.

B. Support Adjustment: Provide grout under supports so-as to bring piping and equipment to proper level and elevations.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

D. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

E. For galvanized surfaces clean welds bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 22 05 48
VIBRATION CONTROL FOR PLUMBING

PART 1 - GENERAL

1.01 DESIGN REQUIREMENTS

A. It is the intent of this Specification to provide the necessary design for the avoidance of excessive noise or vibration in the building due to the operation of machinery or equipment, or due to interconnected piping, ductwork, or conduit and to seismically restraint piping, ductwork, and equipment per the applicable codes against seismic forces in any direction.
   1. All isolators shall:
      a. Be provided by a single manufacturer.
      b. Be designed or treated for resistance to corrosion. Structural steel bases shall be cleaned of welding slag and coated with an SCAQMD compliant primer.
      c. Be selected to perform their function without undue stress or overloading. All isolators shall have a method for leveling and have a 1/4" thick ribbed neoprene acoustical pad under the spring baseplate.
      d. Be installed in a manner to prevent the transmission of vibration to the structure. No rigid connections between rotating or oscillating equipment or piping and the building will be permitted.
      e. Be designed to be non-resonant with equipment forcing frequencies or support structure natural frequencies.
   2. Anchor floor mounted isolated equipment to concrete housekeeping pads of sufficient size to accommodate the anchorage of seismic restraints. Housekeeping pads shall be anchored to the structure as specified by the Structural Engineer of Record.
   3. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge ducts.
   4. Where called for in the specifications or on the drawings, all structural steel bases, including concrete pouring form bases, shall be designed, and fabricated by the isolation manufacturer. Isolation manufacturer shall be a licensed fabricator for the City of Los Angeles, California.
   5. Unless otherwise indicated, all equipment mounted on vibration bases shall have a minimum operating clearance of 1" between structural steel base and floor or support base beneath. The minimum operating clearance between concrete inertia bases and housekeeping pads shall be 1 inch. Check clearance space after installation to ensure that no debris has been left to possibly short circuit isolation bases.
   6. Where necessary due to height limitations, provide height saving brackets.
   7. Design isolators for positive anchorage against uplift and overturning.

1.02 MANUFACTURERS

A. Acceptable Isolation Manufacturer:

B. M. W. Sausse' & Co., Inc. (Vibrex).

C. Mason Industries, Inc.

D. Or Approved Equal.

E. Purchased and/or fabricated equipment must be designed and manufactured with provision for positive anchorage against seismic forces.

F. Seismic restraints for pipes and ducts shall be as per the SMACNA Guidelines for seismic Restraint of Mechanical Systems and shall be approved by DSA.

G. Seismic restraints for equipment and piping shall be designed to meet the criteria of the current California Code of Regulations.

H. The manufacturer of Vibration Isolation and Seismic Control Equipment shall have the following responsibilities:
   1. Determine adequate vibration isolation and seismic restraint sizes and locations.

2. Provide piping and equipment isolation systems and seismic restraints as scheduled and/or specified.
3. Provide installation instructions and drawings to assure proper installation and performance.

1.03 SUBMITTALS

A. Make Submittals in Accordance with:
   1. Contract General Provisions - Division 01.
   2. Mechanical General Provisions - Sections 22 05 00 and 22 05 11.

B. Submit Shop Drawings and Manufacturer's Literature.
   1. Specific vibration isolators and seismic restraints to be utilized showing compliance with the specifications.
   2. Isolation frame construction for each machine including dimensions, structural member sizes, support points and restraint locations and details.
   3. Methods for isolation and restraint of suspended piping, ductwork, and equipment.
   4. Methods for guides and isolation of piping risers.
   5. Seismic restraint calculations signed and stamped by an engineer licensed in the State of California and experienced in the design of isolation and seismic restraint for flexibly mounted equipment.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATOR TYPES

A. "RMS" shall be a laterally stable un-housed spring isolator. Spring, top plate, and baseplate assembly shall be welded. Mounting shall comply with all requirements stated in paragraph above.

B. "RMSG" shall be the same as "RMS" above but shall include height saving brackets for attachment to the equipment frame or isolation base.

C. "RMSP-EQ" shall be the same as "RMS" above except that the spring shall be enclosed in a welded steel cylinder with uplift restraints for horizontal and vertical seismic control.

D. "RMLS-EQ" shall be the same as "RMS" above and shall be equipped with a steel housing designed for seismic restraint and with vertical limit stops to prevent the equipment changing from its loaded height should it be necessary to remove a portion of its weight. This housing may also be used as rigid blocking during rigging so that the installed height and the operating height of the isolated equipment remain the same. O.S.H.P.D. pre-approval # OPA-0029.

E. "RMLS-SB" shall be a steel frame constructed of structural wide flange members unless shown otherwise and shall be rectangular in shape. The depths of the steel members shall not be less than one tenth (1/10) of the longest span between base supports or designed for a maximum beam deflection of .005". If the latter method is used, submittals shall include calculations showing the necessary moment of inertia. All steel members shall be coped and fitted or constructed using the overlap insert method to assure a structural strength that is greater than the individual member strength. The steel frame is placed directly on top of the RMLS-EQ type isolators. O.S.H.P.D. Pre-approved isolator/seismic restraints.

F. "RMU-EQ-SH": shall be an individual semi-housed steel spring isolator complete with vertical motion limit stops incorporating seismic restraints, leveling, and ribbed neoprene pad bonded to the base plate. O.S.H.P.D. pre-approval # OPA-0098.

G. "AS" shall be air spring isolators and shall incorporate the following:
   1. A complete vibration isolation system consisting of a minimum of three air springs and a total of three height sensing valves. If there are two or more air springs per location, they shall be connected to the outlet of the height control valve in parallel. An associated interconnecting air supply system is required which is not included in this work.

2. The air spring shall operate at its normal operating height and the maximum pressure shall not exceed the manufacturer's recommended rating of 100 PSI. The system shall maintain an elevation of +/- 1/8", once adjusted.
3. The type of air spring to be utilized shall be based upon the required natural frequency as indicated in the schedule. In-order to avoid instability, auxiliary height saving brackets, housings, etc. may be utilized, subject to approval.

H. "RP-EQ" shall be a rubber pad type elastomer mounting, consisting of a steel bearing plate with 1/4" thick neoprene ribbed acoustical pad. Maximum loading shall be 60 PSI. Proper anchorage for seismic loads shall be indicated on drawings.

I. FUD-EQ shall be rubber-in-shear isolators incorporating mounting bolts for bolting to equipment base, a bottom steel plate for bolting isolator to sub-base or structure and built-in seismic restraints.

J. "RMXA" shall be a rectangular steel housing that shall be bolted to the overhead structure and designed to allow up to 30 degrees rod misalignment. Hanger shall consist of a steel spring located in a molded neoprene retaining cup with hanger rod bushing.

K. "PRMXA" - Same as type "RMXA" with the addition of a steel load transfer plate so that the equipment or piping operating height is the same as the installed height.

L. "HXA" -Same as type "RMXA" with the addition of a neoprene element in series to isolate the upper connection.

M. "PHXA" - Same as type "HXA" with the addition of a steel load transfer plate so that the equipment or piping operating height is the same as the installed height.

N. "HSS" - shall be a 'rubber in shear' isolator element contained within a rectangular steel housing.

2.02 RAIL AND BASE TYPES

A. "RMR" spring rail isolator. Rails shall have springs of proper size and constant, installed between a continuous structural steel channel (upper member) and a continuous flat steel plate (bottom member) in such manner, quantity, and location that efficient uniform deflection and loading to the structure is assured. Rails shall be furnished with Vibrex hold down stabilizers to restrict excessive amplitudes. Cross bracing must be used when necessary for seismic stability.

B. "RMB" shall be the same as "RMR" above except that it shall be designed as an integral fan and motor base with an adjustable motor slide base.

C. "RMSR" shall be a set of wide flange structural steel rails supplied with height saving brackets to reduce the mounting height of the equipment. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.005". A wide flange section depth greater than 1/10 the supporting span between isolators will be accepted as satisfying the deflection requirement.

D. "RMSB" shall be a steel frame constructed of structural wide flange members unless shown otherwise and shall be rectangular in shape. The depths of the steel members shall not be less than one tenth (1/10) of the longest span between base supports or designed for a maximum beam deflection of .005". If the latter method is used, submittals shall include calculations showing the necessary moment of inertia.

E. All steel members shall be coped and fitted or constructed using the overlap insert method to assure a structural strength that is greater than the individual member strength. Adjustable motor slide bases shall be included when required for centrifugal fan applications. The steel bases shall have an operating clearance of one (1") inch above the supporting structure. Where bases are used to mount pumps, the bases shall be large enough to support the pipe elbows if required.

F. "RMSBI" shall be a steel frame inertia base with all welded members and constructed of structural channel shapes. The base shall be designed for a thickness or inertia mass to equipment weight ratio as shown on the schedule with a minimum thickness of six (6") inches. The bases shall include a template and anchor bolts to anchor the equipment. Inertia bases shall have 1/2" (#4) rebar spaced a maximum of 12" on centers in each direction and located 1-1/2" from the bottom of the base. Adjustable motor slide bases shall be included when required for centrifugal fan applications. Bases shall be supplied with height saving brackets to reduce the mounting height of the equipment.

G. “RMUAB-EQ” shall be a steel frame made of structural angle with type “RMU-EQ-SH” O.S.H.P.D. pre-approved combination isolator/restraints.

H. "RMLSR" shall be a set of multiple wide flange structural steel rails supplied with type RMLS-EQ vibration isolator/seismic restraints and height saving brackets to reduce the mounting height of the equipment. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.005". A wide flange section depth greater than 1/10 the supporting span between isolators will be accepted as satisfying the deflection requirement.

I. Type "RMLSB" shall be a steel frame constructed of structural wide flange members unless shown otherwise and shall be rectangular in shape. The depths of the steel members shall not be less than one tenth (1/10) of the longest span between base supports or designed for a maximum beam deflection of .005". If the latter method is used, submittals shall include calculations showing the necessary moment of inertia. All steel members shall be coped and fitted or constructed using the overlap insert method to assure a structural strength that is greater than the individual member strength. Frame shall be supplied complete with height saving brackets and type RMLS-EQ, O.S.H.P.D. pre-approved isolator/seismic restraints.
   1. Type RMLS-SB is the same as type “RMLSB” but rather than utilizing height saving brackets the steel frame is placed directly on top of the RMLS-EQ type isolators.

2.03 CURB TYPES

A. Type "VIC-EQ-SS" shall be a factory fabricated combination roof mounting curb and vibration isolation base for rooftop package units over 25 tons. The curb assembly shall be designed so that it can be re-roofed without disturbing the HVAC equipment. Curbs must be designed so that roofing material cannot cover access to isolators. The vibration isolation portion of the assembly shall be constructed of structural steel and designed to mate with the bottom of the rooftop unit. System shall include factory fabricated duct supports and any required bracing welded in place. The sheet metal weather proofing curb portion shall be supplied complete with a wood-nailer strip to facilitate flashing by the roofing contractor. Internal vibration isolator/seismic restraints shall be OSHPD pre-approved number OPA-0029 as manufactured by MW Sausse’ & company, inc. Required anchorage calculations shall be supplied with submittal package. When required, curb shall include an optional acoustical package for sound reduction.

B. Type "VIC-EQ" shall be a factory fabricated combination roof mounting curb and vibration isolation base for rooftop package units up to 20 tons. Steel members and cross bracing shall all be welded. The assembly shall be shipped and installed in one piece complete with curb, weather-seal, removable OSHPD pre-approved isolator/restraints #OPA-0098, exterior accessible leveling device, and minimum 14 gage galvanized steel top section to match the unit. Curb shall be fabricated of minimum 12 gage galvanized steel designed to carry the seismic loads to the supporting structure. System shall include factory fabricated duct supports welded in place as well as insulated panels when required. Required anchorage and lower curb structural calculations shall be supplied with submittal package. When required, curb shall include an optional acoustical package for sound reduction. Curb shall be manufactured to match roof slope if specified in drawings.

2.04 SEISMIC RESTRAINTS

A. Shall be capable of safely accepting external forces as specified in the applicable codes without failure. Restraints shall maintain equipment, duct, and piping in a captive position during an earthquake. Restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise under normal operating conditions. Seismic restraints shall be provided on all equipment as scheduled on the drawings. Submit calculations by a Licensed Structural Engineer Registered in State of California to verify snubber capacities.

B. Type "3500" seismic restraint shall be constructed of steel plate, concentric steel pipes, and structural members in an all-welded assembly. All contact points shall be cushioned with minimum 1/4" thick resilient pad. Restraints shall be O.S.H.P.D pre-approved type OPA-0029.

C. Type "3200" seismic restraint shall be all directional type with interlocking steel members constructed of structural angle and A-36 threaded rod. All contact points shall be cushioned with minimum 1/4" thick resilient pad or bushing.

D. Type "CR" seismic restraints shall be constructed of 7x19 strand galvanized aircraft cable. Cable assembly shall come complete with minimum (2) "U" bolt clamps per end and thimbles to protect cable from chafing. Allowed loads shall be the cable breaking strength with a safety factor of three. Actual loads shall be calculated with the worst case of all loads applied to one cable and anchor pattern. Cable shall be installed with 1/4" slack to prevent the transmission of vibration to the structure.

PART 3 - EXECUTION

3.01 GENERAL

A. Install in accordance with manufacturer's written instructions. Vibration isolators must not be installed in a manner that will result in piping stress or misalignment.

B. The structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment or isolators. The isolators shall be installed without raising the equipment and frame assembly.

C. After the entire installation is complete and under full operational load, the isolator shall be adjusted so that the load is transferred from the blocks or shims to the isolator. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.

D. Once the equipment is in operation, install and anchor the seismic restraints with proper operating clearances as indicated on drawings.

E. Plumbing equipment shall be isolated from the building structure by vibration isolators as scheduled on the drawings.

F. All piping 1 1/4" and over located in mechanical equipment rooms, and for a minimum of fifty (50) feet or 100 pipe diameters whichever is greater, from connection to vibrating mechanical or electrical equipment, shall be isolated from the building structure by means of vibration isolators as identified above.

G. All Plumbing piping and vertical risers shall be isolated from the building structure by means of vibration isolators and guides.

H. All piping and ductwork to be isolated shall freely pass-through walls and floors without contact. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork and maintain adequate clearance (Minimum of 2 inches all around) around the outside surfaces. Any materials used to fill the clearance space shall be permanently flexible so that vibration will not pass through it.

I. No rigid connections between equipment and building structure, including electrical conduit and refrigerant lines, shall be made that degrades the vibration isolation system herein specified. Inform other following trades, such as plastering, or electrical, to avoid any contact which would short-circuit the vibration isolation.

J. Bring to the Architect's attention prior to installation any conflicts with other trades which will result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the contractor's expense.

K. Bring to the Architect's attention any discrepancies between the specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the contractor's expense.

L. Obtain inspection and approval of any isolation installation to be covered or enclosed, prior to such closure.

M. Thrust restraints shall consist of spring hangers with the same deflection as specified for the spring mountings. Thrust restraints shall be attached to the fan at the centerline of air discharge opening.

N. Correct, at no additional cost, all installations that are deemed defective in workmanship or materials.

3.02 PIPING ISOLATORS

A. All piping except fire standpipe systems, are included under this section.

B. Isolate piping within 50 feet of rotating equipment and pressure reducing stations.

C. The isolators shall be installed with the isolator hanger box attached to, or hung as close as possible to, approved locations on the supporting structure.

D. The isolators shall be suspended from substantial structural members, not from slab diaphragm unless specifically permitted.

E. Hanger rods shall be aligned to clear the hanger box.

F. Horizontal floor supported piping shall be isolated by type "RMLS-EQ", with a minimum static deflection of 1.0 inch or the same deflection as isolated equipment to which pipe is connected, whichever is greater.

G. Vertical riser pipe support and restraint system shall consist of type "RMS" springs and type "PG-EQ" guides. Install vertical riser guides so that clearances are maintained around concentric pipes in the guides. Install vertical restraints on the floor location as shown on drawings.

H. Pipe anchors, where required, shall utilize resilient pipe anchors, type "RPA" or equivalent, to avoid direct contact of piping with building.

I. Pipe Extension and Alignment connectors: Provide connectors at pump suction and discharge, riser take offs, cooling, and heating coils, and elsewhere as required to accommodate thermal expansion and misalignment.

J. Seismic restraint spacing shall be in accordance with applicable codes.

3.03 INSPECTION

A. On completion of installation of all vibration isolation and seismic control devices herein specified, the local representative of the isolation materials manufacturer shall inspect the completed system and report in writing any installation error, improperly selected isolation devices, or other faults in the system that could affect the performance of the system. The contractor shall submit a report to the Architect, including the above report with consequent steps taken to properly complete the isolation work.

END OF SECTION

SECTION 22 05 53
PLUMBING IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of Plumbing identification work required by this section is indicated on drawings or specified in other Division 22 sections, and includes the following:
   1. Painted Identification Materials.
   2. Plastic Pipe Markers.
   3. Plastic Tape.
   4. Underground-Type Plastic Line Marker.
   5. Plastic Duct Markers.
   6. Valve Tags.
   7. Diagram and Schedule Frames.
   8. Engraved Plastic-Laminate Signs.
   9. Plastic Equipment Markers.
   10. Plasticized Tags.

1.02 RELATED SECTIONS

A. This section is part of each Division 22 section, making reference to identification devices specified herein.

B. HVAC identification furnished as part of factory-fabricated equipment is specified as part of equipment assembly in other Division 22 sections.

C. Refer to Division 26 Sections for identification requirements of electrical work; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Schedules and Diagrams:
   1. Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any).
   2. Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule.
   3. Submit temperature control diagrams and Sequence of Operation on bond paper suitable for framing.

D. Maintenance Data: Include product data and schedules in maintenance manuals; in accordance with requirements of Division 01 and Division 22 Section 22 05 11 "Supplementary Plumbing Requirements."

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
   2. No adhesive-type identification markers will be accepted. All markers and tags shall be permanently attached to pipe, etc.
   3. All identification markers installed exterior of buildings shall be ultra-violet resistant.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide HVAC identification materials of one of the following:
   1. Seton Name Plate Corp.
   2. Allen Systems, Inc.
   3. Brady (W.H.) Co.; Signmark Div.
   4. Industrial Safety Supply Co., Inc.

2.02 PLUMBING IDENTIFICATION MATERIALS

A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 22 sections. Where more than single type is specified for application, selections is Installer's option, but provide single selection for each product category.

2.03 PLASTIC PIPE MARKERS

A. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1.

B. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subject to fluid temperatures of 125oF. (52oC) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.

C. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
   1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
   2. Laminated or bonded application of pipe marker to pipe (or insulation).
   3. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2."

D. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
   1. Laminated or bonded application of pipe marker to pipe (or insulation).
   2. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2" wide; full circle at both ends of pipe marker, taped lapped 3".
   3. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless-steel bands.

E. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.
   1. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

2.04 PLASTIC TAPE

A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.

C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.05 UNDERGROUND TYPE PLASTIC LINE MARKER

A. General: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates the type of service of buried pipe.
   1. Provide multi-ply tape consisting of solid aluminum foil core between 2-layers of plastic tape.

2.06 VALVE TAGS

A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamped-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
   1. Provide 1-1/2" diameter tags, except as otherwise indicated.
   2. Fill tag engraving with black enamel.

B. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves and manufactured specifically for that purpose.

C. Access panel markers: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves and manufactured specifically for that purpose.

D. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.07 DIAGRAM AND SCHEDULE FRAMES

A. General: For each page of schedule and/or diagrams, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.08 ENGRAVED PLASTIC LAMINATE SIGNS

A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, white with black core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.

C. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.09 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in HVAC identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering and wording as indicated, as recommended by the manufacturer’s or as required for proper identification and operation/maintenance of Plumbing systems and equipment.
   1. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, Air Supply No. 1H, Standpipe F12).

2.10 EQUIPMENT MARKERS

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
   1. Data:
      a. Manufacturer, product name, model number, and serial number.
      b. Capacity, operating and power characteristics, and essential data.
      c. Labels of tested compliances.
   2. Location: Accessible and visible.
   3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
   1. Terminology: Match schedules as closely as possible.
   2. Data.
   3. Name and plan number.
      a. Equipment service.
      b. Design capacity.
      c. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
   4. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine sub-core, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
   1. Data: Instructions for operation of equipment and for safety procedures.
   2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
   3. Retain and edit subparagraph above or first subparagraph below.
   4. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
   5. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
   1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.11 PLASTIC DUCT MARKERS

A. Engraved color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finishes, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 PIPING SYSTEM IDENTIFICATION

A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:
   1. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot-non-insulated pipes.

B. Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
   1. Near each valve and control device.
   2. Near each branch, mark each pipe at branch, where there could be question of flow pattern.
   3. Near locations where pipes pass through walls, floors ceilings, or enter non-accessible enclosures.
   4. At access doors, manholes similar access points which permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.

6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment. On piping above removable acoustical ceilings, except omit intermediately.

3.03 UNDERGROUND PIPING IDENTIFICATION

A. General: During back-filling/top soiling of each exterior underground piping systems, except sanitary sewer and storm drainage install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker.

3.04 VALVE IDENTIFICATION

A. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units. List each tagged valve on valve schedule for each piping system.

B. Mount valve schedule frames and schedules in machine rooms, where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

3.05 PLUMBING EQUIPMENT IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of Plumbing equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
   1. Fuel-burning units including boilers, furnaces, heaters.
   2. In addition to the equipment tag, install an identification tag in locations approved by Architect to indicate where each unit is installed above the ceiling. Coordinate the installation location, type, size, and color of this tag with the Architect.

B. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

C. Test of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.06 ADJUSTING AND CLEANING

A. Adjusting: Relocate any Plumbing identification device which has become visually blocked by work of this division or other divisions.

B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION

SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of Plumbing insulation required by this section is indicated on drawings and schedules, and by requirements of this section, and includes the following:
   1. Piping Systems Insulation:
      a. Fiberglass.
      b. Calcium Silicate.
      c. Flexible Unicellular.
   2. Ductwork System Insulation:
      a. Fiberglass.
      b. Flexible Unicellular.
   3. Equipment Insulation:
      a. Fiberglass
      b. Calcium Silicate.
      c. Flexible Unicellular.
   4. Acoustical Insulation:
      a. Fiberglass.

1.02 RELATED SECTIONS

A. Refer to Division 22 Section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.

B. Refer to Division 22 Section "Plumbing Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of Plumbing insulation. Submit schedule showing manufacturer's product number, K-value, thickness, and furnished accessories for each Plumbing system requiring insulation.

B. Maintenance Data: Submit maintenance data and replacement material lists for each type of Plumbing insulation. Include this data and product data in maintenance manual.

1.04 QUALITY ASSURANCE

A. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

B. As a minimum, insulation shall meet installed conductance as set forth in Title 24 California Code of Regulations (CCR) 2016 Building Energy Efficiency Standards or as indicated in contract documents, whichever is greater.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   1. Owens-Corning Fiberglas Corp.
   2. Manville Products Corp.

3. CertainTeed Corp.
4. Armstrong World Industries, Inc.
5. Knauf Fiber Glass GmbH.

2.02 PIPING INSULATION MATERIALS

A. Fiberglass (Mineral Fiber) Piping Insulation: ASTM C547, Class 1 unless otherwise indicated. Manville Products Corp. Micro-Lok, Owens-Corning Fiberglas Corp., ASJ/SL-II or equivalent.

B. Calcium Silicate Piping Insulation: ASTM C533, Type I. Owens-Corning Fiberglass Corp. "Kaylo Asbestos Free" or equivalent.

C. Flexible Unicellular Piping Insulation: ASTM C534, Type I. Armstrong World Industries, Inc. meeting ASTM E-84 25/50 index.

D. Jackets for Piping Insulation: ASTM C921, Type I (Vapor Barrier) for piping with temperatures below ambient. (Type II (Water Vapor Permeable) for piping with temperatures above ambient. Type I may be used for all piping at Installer's option.
   1. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations. Zeston PVC Insulated fitting covers or equivalent.
   2. Encase exterior piping insulation with aluminum jacket with weather-proof construction.

E. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

F. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

G. All Insulation shall be U.L. listed showing flame spread not greater than 25, nor smoke greater than 50, per NFPA 90A.

2.03 EQUIPMENT INSULATION MATERIALS

A. Flexible Fiberglass Equipment Insulation: ASTM C553, Type II, Class F-1, Owens-Corning Fiberglass, Inc., Type 701 1.5 lbs/Ft3.

B. Calcium Silicate Equipment Insulation: ASTM C533, Type I, Block; Owens/Corning Fiberglass, Inc., Kaylo Asbestos Free, U-Grooved block insulation.

C. Jacketing Material for Equipment Insulation: Provide canvas jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.

D. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.

E. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape corner angles, anchors and stud piping as recommended by insulation manufacturer for applications indicated.

F. All Insulation shall be U.L. listed showing flame spread not greater than 25, nor smoke greater than 50, per NFPA 90A.

2.04 ACOUSTICAL INSULATION

A. Rigid Fiberglass Insulation: ASTM C612, Class 1, Owens/Corning Fiberglass, Inc., 10 Lbs/Cu. Ft.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which HVAC insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PLUMBING PIPING SYSTEM INSULATION

A. Insulation Omitted: Omit insulation on the following:
   1. Hot piping within radiation enclosures.
   2. Hot unions, flanges, strainers, flexible connections, and expansion joints.

B. Cold Piping (40ºF to ambient):
   1. Application Requirements: Insulate the following cold HVAC piping systems:
      a. HVAC chilled water supply and return piping.
      b. Air conditioner condensate drains piping.
   2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
      a. Fiberglass: 1" thick for pipe sizes up to and including 4", 1-1/2" thick for pipe sizes over 4".
      b. Flexible Unicellular: 1/2" thick for pipe sizes up to 1-1/2" (A.C. condensate piping only).

C. Hot Low-Pressure Piping (to 250ºF):
   1. Application Requirements: Insulate the following hot low pressure HVAC piping systems (steam piping up to 15 psi, water piping up to 250ºF (121ºC).
      a. HVAC heating water supply and return piping.
   2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
      a. Fiberglass: 1" thick for pipe sizes up to and including 1", 1-1/2" thick for pipe sizes 1-1/2"; 2" thick for piping over 2".

3.03 EQUIPMENT INSULATION

A. Cold Equipment (Below Ambient Temperature):
   1. Application requirements: Insulate the following cold equipment:
      a. Refrigeration equipment, including chillers, tanks, and pumps.
      b. Drip pans under chilled equipment.
      c. Cold and chilled water pumps.
      d. Pneumatic water tanks.
   2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
      a. Fiberglass: 2" thick for cold surfaces above 35ºF and 3" thick for surfaces 35ºF and lower.

B. Hot Equipment (Above Ambient Temperature):
   1. Application Requirements: Insulate the following hot equipment:
      a. Boilers (not pre-insulated at factory).
      b. Water heaters.
      c. Hot water expansion tanks.
      d. Hot water pumps.
   2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation.
      a. Fiberglass: 2" thick, except 3" thick for low-pressure boilers and steam-jacketed heat exchangers.

C. Breeching and Stacks:
   1. Application Requirements: Insulate the following breechings and stacks:
      a. Breechings between heating equipment outlet and stack or chimney connection, except for double wall or factory insulated breechings.

3.04 INSTALLATION OF PIPING INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems, subsequent-to installation of heat tracing, painting, testing, and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulated each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered.

E. Maintain integrity of vapor barrier jackets on pipe insulation and protect to prevent puncture or other damage.

F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.05 INSTALLATION OF EQUIPMENT INSULATION

A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship.

C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.

D. Do not apply insulation to equipment, breechings, or stacks while hot.

E. Apply insulation using the staggered joint method for both single, and double-layer construction, where feasible. Apply each layer of insulation separately.

F. Coat insulated surfaces with layer of insulating cement, trowel in workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

G. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.

H. Do not insulate boiler manholes, hand-holes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

I. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, and accessories.

J. Equipment exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by the manufacturer.

3.06 ACOUSTICAL INSTALLATION

A. Install within confines of roof curbs for roof mounted air handlers and air conditioning units, and elsewhere as indicated on drawings.

B. Cut to fit snugly within curb and around duct at duct penetrations, 4" minimum thickness.

3.07 PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

SECTION 22 10 00
PLUMBING PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies piping materials and installation methods common to more than one section of Division 22 and includes joining materials, fire stop sealants, and basic piping installation instructions.

1.02 RELATED SECTIONS

A. The following sections contain requirements that relate to this section:
   1. Division 22 Section "Common Work Results for Plumbing" applies to this Section.
   2. Piping materials and installation methods peculiar to individual systems are specified withintheir respective system specification sections of Division 02 and 22.
   3. Valves are specified in a separate section and in individual piping system sections of Division 22.
   4. Division 22 Section "Supports and Anchors."
   5. Division 22 Section "Plumbing Identification."

1.03 SUBMITTALS

A. Refer to Division 01 and Division 22 Section "Common Work Results for Plumbing" for administrative and procedural requirements for submittals.

B. Product Data: Submit product data on fire stop sealants.

1.04 QUALITY ASSURANCE

A. Welding procedures and testing shall comply with ANSI Standard B31.1.0 - Standard Code for Pressure Piping, Power Piping, and The American Welding Society, Welding Handbook.

B. Soldering and brazing procedures shall conform to ANSI B9.1 Standard Safety Code for Mechanical Refrigeration.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-applied plastic end-caps on each length of pipe and tube, except for concrete, corrugated metal, hub-and-spigot, and clay pipe. Maintain end-caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes. Elevate above grade and enclose with durable, waterproof wrapping. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings, and specialties from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Refer to the individual piping system specification Sections in Division 22 for specifications on piping and fittings relative to that particular system.

B. Weld-O-Lets: Welding Weld-O-Lets of domestic manufacture may be used in lieu of tees where branch connection pipe size is two or more pipe sizes smaller than main header size.

2.02 JOINING MATERIALS

A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.

C. Soldering Materials: Refer to individual piping system specifications for solder appropriate for each respective system.
   1. Soldering materials shall not contain lead.

D. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.03 SLEEVES AND SEALS

A. Sleeves:
   1. Sheet-Metal Sleeves: 5" and Smaller, 20 gage galvanized sheet metal; 6" and Larger, 10 gage galvanized sheet metal, round tube closed with welded longitudinal joint.
   2. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A53, Grade A.
   3. Galvanized steel telescoping type: Galvanized sheet metal per manufacturer’s standards.
   4. Polyethylene Sleeves: Manufacturer's standard product.

B. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.04 FIRESTOP SEALANT

A. Fire stopping material shall be asbestos-free and capable of maintaining an effective barrier against flame and gases in compliance with the following requirements:
   1. Flame Spread: 25 or less, ASTM E 84.
   2. Smoke Development: 50 or less, ASTM E 84.
   3. Combustibility: Noncombustible, ASTM E 136.

B. Material when installed shall have the same fire rating as the assembly in which it is being installed.

2.05 PIPING ISOLATION

A. Manufacturer's standard product for providing sound and electrolysis isolation.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.02 INSTALLATIONS

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated. Refer to individual system specifications for requirements for coordination drawing submittals.

B. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated otherwise.

C. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

D. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated on the Drawings.

E. Install piping tight to slabs, beams, joists, columns, walls and other permanent elements of the building. Provide space to permit insulation applications, with 1" clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

F. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

G. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple and cap.

H. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals.

I. Coordinate to provide curb, minimum 4" above finish floor, for all pipe shafts or floor openings for multiple pipes.

J. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, or floors, the fire rated integrity shall be maintained.

3.03 PIPE SUPPORTS AND HANGERS

A. All pipe Supports and Hangers shall be per requirements of Specification Section 22 05 29 “Supports And Anchors”.

3.04 FITTINGS AND SPECIALTIES

A. Use fittings for all changes in direction and all branch connections.

B. Remake leaking joints using new materials.

C. Install Y-type strainers with blow-down valves on the supply side of each control valve, pressure reducing or regulating valve, solenoid valve, and elsewhere as indicated.

D. Install unions adjacent to each valve and at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.

E. Install Flanges in piping 2-1/2" and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.

F. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum).

G. Install dielectric fittings to connect piping materials of dissimilar metals in wet piping systems (water, steam).

3.05 JOINTS

A. Steel Pipe Joints:
   1. Pipe 2" and Smaller: Thread pipe with tapered pipe threads in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten to leave not more then 3 threads exposed.
   2. Pipe Larger than 2":
      a. Weld pipe joints (except for exterior water service pipe) in accordance with ASME Code for Pressure Piping, B31.
      b. Weld pipe joints of exterior water service pipe in accordance with AWWA C206.
      c. Install flanges on all valves, apparatus, and equipment. Weld pipe flanges to pipe ends in accordance with ASME B31.1.0 Code for Pressure Piping. Clean flange faces and install gaskets. Tighten bolts to torque specified by manufacturer of flange and flange bolts, to provide uniform compression of gaskets.

B. Non-ferrous Pipe Joints:
   1. Brazed and Soldered Joints: For copper tube and fitting joints, braze joints in accordance withANSI B31.1.0 -Standard Code for Pressure Piping, Power Piping and ANSI B9.1 - Standard Safety Code for Mechanical Refrigeration.
   2. Thoroughly clean tube surface and inside surface of the cup of the fittings, using every fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.

3. Mechanical Joints: Flared compression fittings may be used for refrigerant lines 3/4" and smaller.

C. Joints for other piping materials are specified within the respective piping systems sections.

3.06 INSTALLATION OF SLEEVES

A. Provide pipe sleeves for pipes to pass through walls, floor and roofs. Diameter of sleeve to be 1-inch larger than the outside diameter of pipe or pipe and covering of insulated pipe. Galvanized steel telescoping type sleeves or polyethylene may be used. Where seepage may occur, use steel pipe sleeves.

B. All pipe sleeves through floors other than floors on grade shall extend 2-inches above finished floor and shall be caulked with mineral wool. Provide collar where polyethylene sleeve is used.

C. Where required in existing construction, or where sleeves have been omitted, openings for pipe may be core drilled in floors and/or walls or partitions, providing prior acceptance of such core drilling is obtained from the Architect. Holes core drilled through floors above grade shall be provided with sleeves extending 2-inches above finish floor as hereinbefore specified.

D. Seal with resilient sealant: Dow Corning "Fire Stop" or approved equal.

3.07 INSTALLATION OF FIRE STOP SEALANT

A. Fire-stopping shall be provided at, but not limited to, duct, and piping penetrations through floor slabs and through time rated partitions or firewalls.

B. Install fire-stopping materials in accordance with the manufacturer's instructions and the following requirements.
   1. Filling: Fire-stopping materials shall completely fill the void spaces.

C. Coordination: Coordinate the work with other trades. Firestopping materials at penetrations of insulated pipes and ducts shall be applied prior to insulation, unless the insulation meets the requirements specified for firestopping.

D. Surface Preparation: Surfaces to be in contact with firestopping materials shall be free of dirt, grease, oil, loose material, rust, or other substances that may affect proper fitting or the required fire resistance.

3.08 INSTALLATION OF PIPE ISOLATION

A. Provide sound and electrolysis isolation on all un-insulated, pipes, Semco "Trisolators" or Potter-Roemer "Prisolators".

3.09 INSTALLATION OF PIPE FLASHING

A. Pipe flashing assemblies, "Semco" Fig. 1100-4, as required, seal the joint between flashing and pipe with waterproofing compound. Install counter-flashing sleeve to cover a minimum of 3/4-inch to top of lead flashing, making the top joint permanently watertight.

3.10 TESTING OF PIPING

A. Provide notification of test at least three working days prior to tests on all or part of any piping system. Do not allow or cause any piping system to be insulated, covered, concealed or enclosed until such systems have been tested and reviewed. Provide all necessary materials (including temporary isolation valves or caps), pumps, testing media and labor for testing. Temporarily remove any device in piping system, which will not withstand test pressure specified, and reinstall same after successful testing. Test time begins to accrue after full test pressure is achieved.

B. Testing and inspection of all piping systems and associated equipment for leaks shall be accomplished after installation and cleaning and prior to placing into service. Flanges, threaded joints and all welds shall be left unpainted and uninsulated until the piping systems have been approved.

C. A rigid visual inspection of each specific piping system shall be made prior to conducting tightness tests, to ascertain that all appurtenances and equipment are provided, properly connected and supported, and in all respects ready for testing.

D. Equipment such as pumps, chillers, tanks, heat exchangers, flexible hose, safety valves and similar equipment shall not be subjected to the piping system test pressure. Equipment shall either be disconnected from the piping or be isolated by valves or blanks during testing and reinstalled after acceptance by the Owner.

E. Indicating pressure gauges mounted locally may be tested with the lines provided the test pressure does not exceed the scale range.

F. Orifice plates, rotometers, displacement meters and other line inserts shall either not be installed until completion of all testing, or shall be removed prior to any tests and reinstalled after test has been accepted by the Owner.

G. The application of pressure to a system shall be under control at all times, so that in no case shall the test pressure be exceeded by more than 6 percent.

H. Gauges used for testing shall be tested for accuracy as directed or approved by the Owner, and then installed as close as possible to the low point of the piping system.

I. Do not apply test pressure until the piping system and its contents approach the same temperature.

J. While piping is under test, exercise care that excessive pressure does not occur due to increase in ambient temperature.

K. Control Valves:
   1. Control valves which are installed with block and by-pass valve shall have the block valve closed, the by-pass valve opened, and a temporary pipe piece inserted in place of the control valve (or a test blank may be installed on each side of the control valve) until all flushing and testing of all lines of that system is completed and accepted by the Owner, after which they shall be reinstalled.
   2. Control valves installed without block or by-pass valves shall be replaced by a pipe piece during flushing and testing of the system. After acceptance of the flushing they shall be reinstalled.

L. Minimum piping test pressures shall be as noted in tabulation; or they shall be 150 percent of design pressure for the specific system being tested, whichever is higher.

SYSTEM	TEST MEDIUM	TESTING PRESSURE (PSIG)	DURATION (HOURS	ACCEPTABLE TOLERANCE
Soil, Water, Vent, & Storm Water	Water	Top of highest vent	4	No joint sweat
Water	Water	150	4	None. Except temperature change.
Fuel Gas	Air	60	4	None. Except temperature change.
Fire Sprinkler	Water	200	4	None. Except temperature change.

M. Conduct hydrostatic tests with water at a temperature below 100 degrees F.
   1. Fill the system slowly with water and vent at highest points to expel the air before pressurizing.
   2. Carefully examine all joints for leaks or defects.
   3. Provide connections as required to accomplish the above.

N. Keep accurate test records of each line or system tested and provide copies of same to Owner after acceptance. Each test shall include:
   1. Identification of piping system and test number.
   2. Testing medium.
   3. Test pressure.
   4. Date of test acceptance.

3.11 ADJUSTMENTS

A. At the completion of the Work, completely adjust all valves and equipment for their proper use and rating.

END OF SECTION

SECTION 22 11 16

WATER DISTRIBUTION PIPING (INSIDE BUILDING)

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section includes potable cold water, hot water, and circulation hot water piping, fittings, and specialties within the building to a point of 5 feet outside the building.

1.02 RELATED SECTIONS

A. The following sections contain requirements that relate to this section.
   1. Division 22
      a. Section 220500 “Common Work Results for Plumbing.”
      b. Section 220503 “Earthwork For Plumbing Systems.”
      c. Section 220511 "Supplementary Plumbing Requirements.”
      d. Section 220519 "Meters And Gages.”
      e. Section 220523 “Valves.”
      f. Section 220553 “Plumbing Identification.”
   2. Division 31 Section 31 13 13.
   3. Division 07 Section "Joint Sealers" for materials and methods for sealing pipe penetrations through rated walls and fire and smoke barriers.

B. Separate sections of Division 22 specify Plumbing Piping, Supports and Anchors, piping system identification materials and requirements, general duty valves, pipe insulation, fire protection piping, and plumbing equipment.

1.03 DEFINITIONS

A. Water Distribution Pipe: A pipe within the building or on the premises that conveys water from the water service pipe or meter to the points of usage.

B. Water Service Pipe: The pipe from the water main or other source of potable water supply to the water distributing system of the building served.

C. Pipe sizes used in this Specification are nominal pipe size (NPS).

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specifications Sections.
   1. Product data for each piping specialty and valve specified.
   2. Test reports specified in Part 3 of this Section.
   3. Maintenance data for each piping specialty and valve specified for inclusion in Maintenance Manual specified in Division 01 and Division 22 Section "Common Work Results for Plumbing."

1.05 QUALITY ASSURANCE

A. Codes and Standards
   1. California Building Code 2016, Title 24, Part 2 for Accessibility Requirements.
      a. Accessible plumbing fixtures for adults; dimensions shall comply with the requirements of CCT, T-24, Section 1115.B.
      b. Heights and location of fixtures shall be according to CCR, T-24, Chapter 11-B and Table 1115.B-1.
      c. Fixture Controls shall comply with CCR, T-24 Section 1115.B.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-applied plastic end-caps on each length of pipe and tube, except for concrete, corrugated metal, hub-and-spigot, clay pipe. Maintain end caps through shipping, storage and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes. Elevate above grade and enclose with durable, waterproof wrapping. When stored inside, do not exceed structural capacity of the floor.

C. Protect flanges, fittings and specialties, from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

D. Store CPVC, and PVC pipe and fittings where protected from direct sunlight.

E. Store pipe in a manner to prevent sagging and bending.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate the size and location of concrete equipment pads. Cast anchor-bolt inserts into pad. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate the installation of pipe sleeves for foundation wall penetrations.

1.08 EXTRA MATERIALS

A. Maintenance Stock: Furnish one valve key for each key-operated wall hydrant, hose bib, fixture supply, or faucet installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer Uniformity: Conform to the requirements specified in Division 22 Section "Common Work Results For Plumbing."

1. Hose Bibs:
   a. Acorn
   b. Woodford Mfg. Co.
   c. Watts Regulator Co.
2. Relief Valves:
   a. Cash (A. W.) Valve Mfg. Corp.
   b. Watts Regulator Co.
   c. Zurn Industries, Inc. Wilkins Regulator Divs.
3. Water Hammer Arresters:
   a. Precision Plumbing Products, Inc.
   b. Smith (Jay R.) Mfg. Co.
   c. Sioux Chief
   d. Watts Regulator Co.
   e. Zurn Industries, Inc.; Hydromechanics Div.
4. Vacuum Breakers for Hose Connections:
   a. Cash (A.W.) Valve Mfg. Corp.
   b. Conbraco Industries, Inc.
   c. Watts Regulator Co.
5. Mechanical Sleeve Seals:
   a. Thunderline Corp.
6. Pipe Escutcheons:
   a. McGuire
   b. BrassCraft
   c. Pasco
7. Dielectric Waterway Fittings:
   a. Epco Sales, Inc.
   b. Victaulic Company of America

8. Dielectric Unions:
   a. Eclipse, Inc.
   b. Perfection Corp.
   c. Watts Regulator Co.

2.02 PIPE AND TUBE MATERIALS, GENERAL

A. Pipe and Tube: Refer to Part 3, Article "Application, General," for identification of systems where the below materials are used.

B. Copper Tube: (Within Building) ASTM B88, Type L Water Tube, drawn temper.

C. Copper Tube: (Underground) ASTM B88, Type K Water Tube, annealed temper.

2.03 FITTINGS

A. Wrought Copper Solder-Joint Fittings: ANSI B16.22, streamlined pattern.

B. Wrought Copper and Bronze Grooved-End Fittings: ASTM B75 Tube and ASTM B584 Bronze Castings.

C. Unions: ASME B16.39, malleable iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces, female threaded ends. Threads shall conform to ASME B1.20.1.

D. Dielectric Unions: Threaded, solder, or grooved-end connections as required to suit application; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

E. Dielectric Unions: Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze wire reinforced protective jacket; minimum 150 psig working pressure, maximum 250 degree F operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be 12" long and capable of 3/4-inch misalignment. Sweat ends are not acceptable.

2.04 JOINING MATERIALS

A. Solder Filler Metal: ASTM B32, 95-5 Tin-Antimony 'lead-free' solder.

B. Brazing Filler Metals: AWS A5.8, BCUP Series.

C. Gasket Material: Thickness, material, and type suitable for fluid to be handled and design temperatures and pressure.

2.05 GENERAL DUTY VALVES

A. General-duty valves (i.e., gate, globe, check, ball, and butterfly valves) are specified in Division 22 Section "Valves." Special duty valves are specified below by their generic name; refer to Part 3 Article "Valve Application" for specific uses and applications for each valve specified.

2.06 SPECIAL DUTY VALVES

A. Balance Cocks: 400 PSI WOG, 2 piece, ball valve, handle, memory stop, with threaded-end connections conforming to ASME B1.20.1.

B. Balance Cocks: 400 PSI WOG, 2 piece bronze, ball valve, handle, memory stop, with solder-end connections.

2.07 PIPING SPECIALTIES

A. Water Hammer Arresters:
   1. J.R. Smith or Approved Equal.
   2. Bellows type, with stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201 shall be of the following sizes unless otherwise indicated on the drawings:
      a. Self-closing valves, lavatories, sinks, etc.

Supply header or pipe size (Inch)	Manufacturer Name	Water Hammer Arrester Model No.
1/2"	J.R. Smith	5005
3/4"	J.R. Smith	5005
1"	J.R. Smith	5010

   3. Flushometer, automatic and solenoid valves:
      a. J.R. Smith or Approved Equal.

Supply header or pipe size (Inch)	Manufacturer Name (a)	Water Hammer Arrester Model No.
3/4”	J.R. Smith	5010
1”	J.R. Smith	5010
1-1/4"	J.R. Smith	5030
1-1/2"	J.R. Smith	5040
2”	J.R. Smith	5050

B. Y-Type Strainers: Provide strainers full line size of connecting piping, with ends matching piping system materials. Screens shall be Type 304 stainless steel, with 3/64" perforations at 233 per square inch. Strainers in copper lined to have bronze bodies.
   1. Provide strainers with 125 psi working pressure rating for low pressure applications, and 250 psi pressure rating for high pressure application.
   2. Threaded ends, 2" and Smaller: Cast-iron body, or bronze body, screwed screen retainer with centered blow-down fitted with pipe plug.
   3. Threaded Ends, 2-1/2" and Larger: Cast-iron body or bronze body bolted screen retainer with off-center blow-down fitted with pipe plug.
   4. Flanged Ends, 2-1/2" and Larger: Cast-iron body or bronze body, bolted screen retainer with off-center blow-down fitted with pipe plug.

C. Hose-Connections: Hose connections shall have garden hose threaded outlets conforming to ASME B1.20.7.

D. Hose Bibs: Bronze body with chrome- or nickel-plated finish, with renewable composition disc, removable wheel handle, vacuum breaker, 3/4- inch solder inlet, hose outlet.

E. Vacuum Breakers: Hose connection vacuum breakers shall conform to ASSE Standard 1011, with finish to match hose connection.

F. Relief Valves: Sizes for relief valves shall be in accordance with ASME Boiler and Pressure Vessel Codes for indicated capacity of the appliance for which installed.
   1. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Temperature relief valves shall be factory set at 210 deg. F, and pressure relief at 150 psi.

G. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation.

H. Sleeves:
   1. Sheet-Metal Sleeves: 10 gage, galvanized sheet metal, round tube closed with welded longitudinal joint.
   2. Steel Sleeves: Schedule 40 galvanized, welded steel pipe, ASTM A53, Grade A.

I. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine rough-in requirements for plumbing fixtures and other equipment with water connections to verify actual locations of piping connections prior to installation.

3.02 PREPARATION

A. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris for both inside and outside of piping and fittings before assembly.

3.03 PIPE APPLICATIONS

A. Install Type L, drawn copper tube with wrought copper fittings and solder joints for pipe sizes 4 inches and smaller, above ground, within building.

B. Install Type K, annealed temper copper tube for pipe sizes 2 inches and smaller, with minimum number of joints, below ground.

C. Water piping in sizes 2-1/2 to 6 inches may be Type L drawn copper tube with roll-grooved ends and mechanical couplings, above ground within building.

3.04 PIPING INSTALLATION

A. General Locations and Arrangements; Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and branch connections.

C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all piping installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap.

I. Pipe sleeves smaller than 6 inches shall be galvanized steel pipe; pipe sleeves 6 inches and larger shall be galvanized steel sheet metal.

J. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls with sleeves and mechanical sleeve seals.

K. Fire Barrier Penetrations: Where pipes pass though fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 07 for special sealers and materials.

3.05 HANGERS AND SUPPORTS

A. General: Hanger, support, and anchor devices conforming to MSS SP-69 are specified in Division 22, Section "Supports and Anchors." Conform to the table below for maximum spacing of supports:

B. Pipe Attachments: Install the following:
   1. Adjustable steel clevis hangers, MSS Type 1, for individual horizontal runs less than 20 feet in length.
   2. Adjustable roller hangers, MSS Type 43, and spring hangers, MSS Type 41 with Type 49, for individual horizontal runs 20 feet and longer.
   3. Pipe roll, complete MSS Type 44 for multiple horizontal runs, 20 feet or longer, support on a trapeze.
   4. Spring hangers to support vertical runs.

C. Install hangers for horizontal piping with the following maximum spacing and minimum rod sizes:

Steel & Copper Nom. Pipe Size – In.	Steel Pipe Max. Span – Ft.	Steel Pipe Min. Rod	Copper Tube Max. Span – Ft.	Copper Tube Min. Rod
Up to 3/4	7	3/8	5	3/8
1	7	3/8	6	3/8
1-1/4	7	3/8	7	3/8
1-1/2	9	3/8	8	3/8
2	10	3/8	8	3/8
2-1/2	11	3/8	9	3/8
3	12	1/2	10	1/2
3-1/2	13	1/2	11	1/2
4	14	5/8	12	1/2
5	16	5/8	13	1/2
6	17	3/4	14	5/8
8	19	7/8	16	3/4
10	22	7/8	18	3/4
12	23	7/8	19	3/4

D. Support vertical steel pipe and copper tube at each floor.

3.06 PIPE AND TUBE JOINT CONSTRUCTION

A. Soldered Joints: Comply with the procedures contained in the AWS "Soldering Manual."

B. Brazed Joints: Comply with the procedures contained in the AWS "Brazing Manual."
   1. CAUTION: Remove stems, seats, and packing of valves and accessible internal parts of piping specialties before soldering and brazing.
   2. Fill the tubing and fittings during soldering and brazing with an inert gas (nitrogen or carbon dioxide) to prevent formation of scale.
   3. Heat joints to proper and uniform temperature.

C. Threaded Joints: Conform to ASME B1.20.1, tapered pipe threaded for field-cut threads. Join pipe fittings and valves as follows:
   1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
   2. Align threads at point of assembly.
   3. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).

4. Assembly joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.
    a. Damaged Threads: Do not use pipe with corroded or damaged threads. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

D. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

E. Grooved-End Joints: Prepare pipe and tubing and install in accordance with manufacturer's installation instructions.

3.07 SERVICE ENTRANCE

A. Extend water distribution piping to connect to water service piping, of size and in location indicated for service entrance to building. Water service piping is specified in separate section of Division 22.

B. Install sleeve and mechanical sleeve seal at penetrations through foundation wall for watertight installation.

3.08 VALVE APPLICATIONS

A. General-Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
    1. Shut-off duty: Use gate, ball, and butterfly valves.
    2. Throttling duty: Use globe and ball valves.

3.09 INSTALLATION OF VALVES

A. Sectional Valves: Install sectional valves on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated. For sectional valves 2 inches and smaller, use gate valves; for sectional valves 2-1/2 inches and larger, use gate or butterfly valves.

B. Shutoff Valves: Install shutoff valves at inlet and outlet of each plumbing equipment item and elsewhere as indicated.
    1. At plumbing equipment: 2" and smaller use gate or ball valves.
    2. At plumbing equipment: 2-1/2" and larger use gate or butterfly valves.
    3. For plumbing fixtures see fixture trim.
    4. All other locations use gate valves.

C. Drain Valves: Install drain valves on each plumbing equipment item, located to drain equipment completely for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to drain distribution piping system completely. For drain valves use 3/4" hose end drain valve.

D. Hose Bibs: Install on exposed piping where indicated. Provide vacuum breaker.

3.10 INSTALLATION OF PIPING SPECIALTIES

A. Install backflow Preventers at each connection to mechanical equipment and systems and in compliance with the plumbing code and authority having jurisdiction. Install air cap fitting and pipe relief outlet drain without valves to nearest floor drain. Identify all piping downstream of backflow preventers as "industrial water".

B. Install pressure-regulating valves with inlet and outlet shutoff valves and balance cock bypass. Install pressure gage on valve outlet.

3.11 INSTALLATION OF PIPING WATER HAMMER ARRESTORS

A. Provide an air chamber at each valve water outlet or fixture supply for fixtures with manual closing valves. Air chamber shall be 18 inches long and one pipe size larger than supply to outlet. For a battery of fixtures, one air chamber 30 inches long and the full size of the header, but not less than 1 inch may be installed in lieu of individual air chambers. Precision Plumbing Products, JMJ "System Rated" arrestors are acceptable in lieu of air chambers.

B. Install water hammer arrestors on supply line to fixtures with self-closing, automatic or Flushometer valves. Arrestors shall be as close as possible to individual fixtures and on the end of the header for a battery of fixtures. Arrestors shall be installed in the wall or furring, whenever possible, behind an access panel large enough to permit removal of the arrestor. Sizes as shown on the drawings or as specified hereinafter. Sizes and model numbers are J. R. Smith; equivalent arrestors by Josam, Wade or Zurn are acceptable.

3.12 EQUIPMENT CONNECTIONS

A. Piping Run-outs to Fixtures: Provide hot and cold water piping Run-outs to fixtures of sizes indicated, but in no case smaller than required by plumbing code.

B. Equipment Connections: Connect hot and cold water piping system to equipment as indicated. Provide shutoff valve and union for each connection; provide drain valve on drain connection. For connections 2-1/2 inches and larger, use flanges instead of unions.

3.13 FIELD QUALITY CONTROL

A. Inspections: Inspect water distribution piping as follows:
   1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During the progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
      a. Rough-In Inspection: After system is roughed in and prior to setting fixtures, arrange for inspection of the piping system before concealed or closed in.
      b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to ensure compliance with the requirements of the plumbing code.
   3. Re-inspections: Whenever the plumbing official finds that the piping system will not pass the test or inspection, make the required corrections, and arrange for re-inspection by the plumbing official.
   4. Reports: Prepare inspection reports signed by the plumbing official.

B. Test water distribution piping as follows:
   1. Test for leaks and defects all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
   2. Leave uncovered and unconcealed all new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose all such work for testing that has been covered or concealed before it has been tested and approved.
   3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding the pressure rating of the piping system materials. Isolate the test source and allow to-stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Repair all leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
   5. Prepare reports for all tests and required corrective action.

3.14 ADJUSTING AND CLEANING

A. Clean and disinfect water distribution piping as follows:
   1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired prior to use.

2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, the procedure described in either AWWA C651, or AWWA C652, or as described below:
   a. Flush the piping system with clean, potable water until dirty water does not appear at the points of outlet.
   b. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
   c. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
   d. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
   e. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

B. Prepare reports for all purging and disinfecting activities.

3.15 COMMISSIONING

A. Fill the system. Check compression tanks, where used, to determine that they are not air bound and that the system is completely full of water.

B. Before operating the system, perform these steps:
   1. Close drain valve, hydrants, and hose bibs.
   2. Open valves to full-open position.
   3. Remove and clean strainers.
   4. Check pumps for proper direction of rotation. Correct improper wiring.
   5. Lubricate pump motors and bearings.

END OF SECTION

SECTION 22 11 19
PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies piping specialties and installation methods common to more than one section of Division 22.

1.02 RELATED SECTIONS

A. This section applies to all piping systems specified in Division 22.

B. Valves are specified in a separate section and in individual piping system Sections of Division 22.

C. Fire Barrier Penetration Seals are specified in Section 22 10 00.

1.03 SUBMITTALS

A. Refer to Division 01 and Section 22 05 00 “Common Work Results for Plumbing” for administrative and procedural requirements for submittals.

B. Product Data: Submit product data on the following items:
   1. Escutcheons
   2. Dielectric Unions and Fittings
   3. Mechanical Sleeve Seals
   4. Strainers

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect flanges, fittings, and specialties from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer Uniformity: Conform to the requirements specified in Common Work Results for Plumbing, under "Product Options."

B. Manufacturer: Subject to compliance with requirements, provide piping materials and specialties from one of the following:
   1. Pipe Escutcheons:
      a. McGuire
      b. BrassCraft
      c. Pasco
   2. Dielectric Waterway Fittings:
      a. Epco Sales, Inc.
      b. Victaulic Company of America
   3. Dielectric Unions:
      a. Eclipse, Inc.
      b. Perfection Corp.
      c. Watts Regulator Co.
   4. Strainers:
      a. Armstrong Machine Works
      b. Hoffman Specialty ITT; Fluid Handling Div.
      c. Metraflex Co.
      d. R-P&C Valve; Div. White Consolidated Industries, Inc.
      e. SpiraxSarco
      f. Trane Co.
      g. Victaulic Co. of America. (low-pressure applications only).
      h. Watts Regulator Co.

5. Mechanical Sleeve Seals:
   a. Thunderline Corp.

2.02 PIPE AND FITTINGS

A. Refer to the individual piping system specification sections in Division 22 for specifications on piping and fittings relative to that particular system.

2.03 JOINING MATERIALS

A. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

B. Brazing Materials: Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials appropriate for the materials being joined.

C. Soldering Materials: Refer to individual piping system specifications for solder appropriate for each respective system.

D. Gaskets for Flanged Joints: Gasket material shall be full-faced for cast-iron flanges and raised-face for steel flanges. Select materials to suit the service of the piping system in which installed and which conform to their respective ANSI Standard (A21.11, B16.20, or B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

2.04 PIPING SPECIALTIES

A. Escutcheons: Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

B. Unions: Malleable-iron, Class 150 for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

C. Dielectric Unions: Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action, and stop corrosion.

D. Dielectric Waterway Fittings: Electroplated steel or brass nipple, with an inert and non-corrosive, thermoplastic lining.

E. Y-Type Strainers: Provide strainers full line size of connecting piping, with ends matching piping system materials. Screens shall be Type 304 stainless steel, with 3/64" perforations at 225 holes per square inch.
   1. Provide strainers with 125 psi working pressure rating for low-pressure applications, and 250 psi pressure rating for high-pressure application.
   2. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
   3. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
   4. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blow-down fitted with pipe plug.
   5. Butt Welded Ends, 2-1/2" and Larger for Low Pressure Application: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
   6. Butt Welded Ends, 2-1/2" and Larger for High Pressure Application: Schedule 80 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
   7. Grooved Ends, 2-1/2" and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EDPM gasket.

F. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 - EXECUTION

3.01 ESCUTCHEONS

A. Install escutcheons at all exposed penetrations of piping through walls, ceilings, and floors in rooms with finish surfaces.

3.02 FITTINGS AND SPECIALTIES

A. Install strainers on the supply side of each control valve, pressure reducing or regulating valve, solenoid valve, and elsewhere as indicated.

B. Install unions adjacent to each valve and at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.

C. Install Flanges in piping 2-1/2" and larger, where indicated, adjacent to each valve, and at the final connection to each piece of equipment.

D. Install dielectric unions to connect piping materials of dissimilar metals in dry piping systems (gas, compressed air, vacuum).

E. Install dielectric fittings to connect piping materials of dissimilar metals in wet piping systems (water, steam).

END OF SECTION

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes building sanitary and storm drainage and vent piping systems, including drains and drainage specialties.

1.02 RELATED SECTIONS

A. The following sections contain requirements that relate to this section:
   1. Division 22 Section "Plumbing Identification," for labeling and identification of drainage and vent piping.

1.03 DEFINITIONS

A. Building Drain: That part of the lowest piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer.

B. Building Sewer: That part of the piping within public or private premises which conveys sewage, rain water or other liquid wastes to a point of disposal.

C. Drainage System: Includes all the piping within public or private premises which conveys sewage, rain water or other liquid wastes to a point of disposal. It does not include the mains of public sewer systems or a private or public sewage treatment or disposal plant.

D. Vent System: A pipe or pipes installed to provide a flow of air to or from a drainage system, or to provide a circulation of air within such system to protect trap seals from siphonage and backpressure.

1.04 SUBMITTALS

A. Product data for the following products:
   1. Drainage piping specialties.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the provisions of the following:
   1. California Plumbing Code (CPC): Current edition in use by authority having jurisdiction.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate the installation of roof drains, flashing, and roof penetrations.

B. Coordinate flashing materials installation of roofing, waterproofing, and adjoining substrate work.

C. Coordinate the installation of drains in poured-in-place concrete slabs, to include proper drain elevations, installation of flashing, and slope of slab to drains.

D. Coordinate with installation of sanitary and storm sewer system as necessary to interface building drains with drainage piping system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide drainage and vent systems from one of the following:
   1. Drainage Piping Specialties, including backwater valves, expansion joints, drains, trap primers, and vandal-proof vent caps:
      a. J. R. Smith Mfg. Co.
      b. Josam Mfg. Co.
      c. Zurn Industries Inc; Hydromechanics Div.
      d. Tyler Pipe; Subs. of Tyler Corp.

2.02 ABOVE GROUND DRAINAGE AND VENT PIPE AND FITTINGS

A. General: Select from the following options:
   1. Pipe Sizes Larger than 2": Cast-iron soil pipe. Conform to ASTM A74, for service weight, hub-and-spigot soil pipe and fittings, with clamps and compression gasket joints conforming to ASTM C564. Piping shall bear the CISPI stamp.
   2. Pipe Sizes Larger than 2": Hub-less cast-iron soil pipe. Conform to CISPI Standard 301, Service weight, cast-iron soil pipe and fittings, with neoprene gaskets conforming to CISPI Standard 310. Piping shall bear the CISPI stamp.

2.03 UNDERGROUND BUILDING DRAIN PIPE AND FITTINGS

A. Pipe and fittings shall have heavy coating of coal tar varnish or 'asphaltum' on both inside and outside surfaces.

B. General: For pipe and fittings below grade and/or below finish floor of floors on grade select from the following options:
   1. Pipe Sizes 15" and Smaller: Cast-iron soil pipe. Conform to ASTM A74, for standard weight hub and spigot soil pipe and fittings, with clamps and neoprene gasket, conforming to ASTM C564. Piping shall bear the CISPI stamp.
   2. Pipe Sizes 16" and Smaller: Hub-less cast iron soil pipe, conform to CISPI Standard 301, service weight; with "Best" or "MG" cast iron joint connection couplings. Coupling body shall conform to ASTM A-48 or ASTM A-74 with neoprene gasket conforming to ASTM C-564. Piping shall bear the CISPI stamp.

2.04 DRAINAGE PIPE SPECIALTIES

A. Trap Primers: Bronze body valve with automatic vacuum breaker, with 1/2 inch connections matching piping system. Complying with ASSE 1018.

B. Expansion Joints: Cast-iron body with adjustable bronze sleeve, bronze bolts with wing nuts.

C. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.

2.05 CLEANOUTS

A. Cleanouts on cast iron soil pipe, iron body with ABS plugs screwed into caulking ferrules. Cleanouts on steel pipe, ABS plugs. Cleanouts on vitrified clay pipe, vitrified clay pipe. Where cleanouts occur in finished interior surfaces, smooth polished chromium plated. Exposed parts of floor cleanouts in finished rooms, non-slip polished nickel bronze. Floor cleanouts adjustable type. Where cleanouts occur in carpeted floor areas, the cover shall be elevated so as to be flush with finished carpeted areas.

B. Floor Cleanouts: Cast-iron body and frame, with cleanout plug and adjustable round top as follows:
   1. Floor level type in rooms with concrete floor: Smith #4021, Josam 58330-2, or Zurn Z1420-25 with cast iron top.

C. Wall Cleanouts: Cast-iron body adaptable to pipe with ABS plastic plug; stainless steel cover including screws.
   1. Wall type for cast-iron pipes: Smith #4532, Josam 58790-4, or Zurn Z-1445-1.
   2. Wall type for steel pipes: Smith #4472, Josam 58890-4, or Zurn 1460-8.

D. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide under-deck clamp and sleeve length as required.

E. Vent Flashing Sleeves: Cast-iron caulking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks.

F. Vandal-Proof Vent Caps: Cast-iron body full size of vent pipe, with caulked base connection for cast-iron pipes, threaded base for steel pipes.

2.06 FLOOR DRAINS

A. Floor drains are specified in Section 22 42 00 "Commercial Plumbing Fixtures."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify all dimensions by field dimensions. Verify that all drainage and vent piping and specialties may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.

B. Verify existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.

C. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation.

D. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.

E. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION FOUNDATION FOR UNDERGROUND BUILDING DRAINS

A. Grade trench bottoms to provide a smooth, firm, and stable foundation, free from rock, throughout the length of the pipe.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated invert elevation.

C. Shape bottom of trench to fit bottom of pipe for 90-degrees (bottom 1/4 of the circumference). Fill unevenness with tamped sand backfill. At each pipe joint dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation.

3.03 PIPE APPLICATIONS - ABOVE GROUND, WITHIN BUILDING

A. General: Select from following options:
   1. Install hub-and spigot, service weight, cast-iron soil pipe with compression gasket joints for larger than 2 inches drainage and vent pipe. Piping shall bear the CISPI stamp.
   2. Install Hub-less, service weight, cast-iron soil pipe and fittings for larger than 2 inch drainage and vent pipe. Piping shall bear the CISPI stamp.

3.04 PIPE APPLICATIONS - BELOW GROUND, WITHIN BUILDING

A. General: Select from the following options:
   1. Install hub-and-spigot, heavy service weight, cast-iron, soil pipe and fittings with gasket joints for 15 inch and smaller drainage pipe. Piping shall bear the CISPI stamp.
   2. Install hub-less, service weight, cast-iron soil pipe with Anaco Husky SD 4000 stainless steel couplings with neoprene gaskets. Piping shall bear the CISPI stamp.

3.05 PIPE AND TUBE JOINT CONSTRUCTION

A. Copper Tubing: Solder joints in accordance with the procedures specified in AWS "Soldering Manual."

B. Cast-Iron Soil Pipe: Make lead and oakum caulked joints, compression joints, and hub-less joints in accordance with the recommendations in the CISPI Cast Iron Soil Pipe and Fittings Handbook, Chapter IV.

C. Install couplings per manufacturer's recommendations.

3.06 INSTALLATION

A. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the piping systems. Location and arrangement of piping layout take into account many design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and all branch connections.

C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

D. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

F. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Allow sufficient space above removable ceiling panels to allow for panel removal.

G. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inch shall be steel; pipe sleeves 6 inches and larger shall be sheet metal.

H. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings and floors, maintain the fire rated integrity.

I. Make changes in direction for drainage and vent piping using appropriate 45 degree wyes, half-wye, or long sweep quarter, sixth, eight, or sixteenth bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn tees where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size, standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

J. Install underground building drains to conform with the plumbing code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

K. Install building drain pitched down at minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger.

L. Extend building drain to connect to sewer piping, of size and in location indicated for service entrance to building. Sewer piping is specified in a separate section of Division 22.

M. Install sleeve and mechanical sleeve through foundation wall for watertight installation.

3.07 HANGERS AND SUPPORTS

A. General: Hangers, supports, and anchorage devices are specified in Division 22 Section "Plumbing Piping." Conform to the table below for maximum spacing of supports:

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.

C. Install hangers at the following intervals:

Pipe material	Max. Horizontal Spacing (Ft.)	Max. Vertical Spacing (Ft.)
Cast Iron Pipe	5	15
Copper Tubing 1-1/2” & Smaller	6	10
Copper Tubing 2” & Larger	10	10

3.08 INSTALLATION OF PIPE SPECIALTIES

A. Install backwater valves in sanitary building drain piping as indicated, and as required by the plumbing code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover and of adequate size to remove valve cover for service.

B. Install expansion joints on vertical risers as indicated, and as required by the plumbing code.

C. Above Ground Cleanouts: Install in above ground piping and building drain piping as indicated, and:
   1. As required by plumbing code.
   2. At each horizontal change in direction of piping greater than 135 degrees.
   3. At maximum intervals of 50' for piping 3" and smaller and 100' for larger piping.
   4. At base of each vertical soil or waste stack.

D. Cleanouts Covers: Install floor and wall cleanout covers for concealed piping.

E. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

3.09 INSTALLATION OF TRAP PRIMERS

A. Install trap primers with piping pitched towards drain trap, minimum of 1/8 inch per foot (1 percent). Adjust trap primer for proper flow. Provide trap primer for all floor drains and floor sinks. Multiple outlet primers are acceptable.

3.10 CONNECTIONS

A. Piping Run-outs to Fixtures: Provide drainage and vent piping run-outs to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the plumbing code.

3.11 FIELD QUALITY CONTROL

A. Inspections:
   1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During the progress of the installation, notify the plumbing official having jurisdiction, at least 24 hours prior to the time such inspection must be made. Perform tests specified below in the presence of the plumbing official.
      a. Rough-In Inspection: Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures.
      b. Final Inspection: Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the plumbing code.
   3. Re-inspections: Whenever the piping system fails to pass the test or inspection, make the required corrections, and arrange for re-inspection by the plumbing official.
   4. Reports: Prepare inspection reports, signed by the plumbing official.

B. Piping System Test: Test drainage and vent system in accordance with the procedures of the authority having jurisdiction, or in the absence of a published procedure, as follows:
   1. Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
   2. Leave uncovered and unconcealed all new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose all such work for testing, which has been covered or concealed before it has been tested and approved.

3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open jointed drain tile, test the piping of plumbing drainage and venting systems upon completion of the rough piping installation. Tightly close all openings in the piping system, and fill with water to the point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before the inspection starts, through completion of the inspection. Inspect all joints for leaks.
4. Finished Plumbing Test Procedure: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight. Plug the stack openings on the roof and building drain where it leaves the building, and introduce air into the system equal to a pressure of 1" water column. Use a "U" tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without the introduction of additional air throughout the period of inspection. Inspect all plumbing fixture connections for gas and water leaks.
5. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
6. Prepare reports for all tests and required corrective action.

3.12 ADJUSTING AND CLEANING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Clean drain strainers, domes, and traps. Remove dirt and debris.

3.13 PROTECTION

A. Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

END OF SECTION

22 34 36

COMMERCIAL GAS DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of water heater work required by this section is indicated on drawings and schedules, and by requirements of this section.

1.02 RELATED SECTIONS

A. Refer to other Division 22 Sections for water piping, specialties, pumps, fuel piping, and breechings which are required external to water heaters for installation; not work of this section.

B. Refer to other Division 25 Sections for field installed automatic temperature controls required in conjunction with water heaters; not work of this section.

C. Electrical Work: Refer to Division 22 Section "Common Motor Requirements for Plumbing Equipment" for requirements.

D. Refer to Division 26 Sections for other electrical wiring including motor starters, disconnects, wires/cables, raceways, and other required electrical devices; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data including rated capacities and efficiencies of selected model clearly indicated; operating weights; furnished specialties and accessories; and installation and start-up instructions.

B. Wiring Diagrams: Submit manufacturer's electrical requirements for electrical power supply wiring to water heaters. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between portions that are to be field-installed.

C. Warranties: Submit certificates for all heaters requiring extended warranties.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of water heaters of types and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:
   1. UL Compliance: Construct water heaters in accordance with the following UL standards:
      a. UL 174, "Household Electric Storage-Tank Water Heaters."
      b. UL 1453, "Electric Booster and Commercial Storage Tank Water Heaters."
   2. California Code of Regulations (CCR): All water heater models submitted for review shall have identification label on certification showing compliance with CCR Title 24, "Energy Conservation Standards."
   3. NEC Compliance: Install electric water heaters in accordance with requirements of NFPA 70, "National Electrical Code."
   4. NFPA Compliance: Install gas-fired water heaters in accordance with requirements of NFPA 54, "National Fuel Gas Code."
   5. AGA (and NSF) Labels: Provide water heaters which are listed and labeled by American Gas Association and (National Sanitation Foundation.)
   6. ASHRAE Compliance: Provide water heaters with Performance Efficiencies not less than prescribed in ASHRAE 90A, "Energy Conservation in New Building Design."

1.05 DELIVERY, STORAGE, AND HANDING

A. Handle water heaters and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged water heaters or components; remove from site and replace with new.

B. Store water heaters and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with manufacturer's rigging and installation instructions for unloading water heaters, and moving units to final location for installation.

1.06 SPECIAL PROJECT WARRANTY

A. Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, water heaters with inadequate or defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
   1. Warranty Period: 5 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 COMMERCIAL GAS FIRED WATER HEATERS

A. General: Provide commercial gas-fired water heaters of sizes and capacities as indicated on schedule. Provide certification of design by AGA under Volume III tests for commercial water heaters for delivery of 180 degree F (982 degree C) water.

B. Heater: Construct for working pressure of 150 PSI; boiler type hand hole cleanout; magnesium anode rod; 3/4" tapping for relief valve; glass lining on internal surfaces exposed to water.

C. Safety Controls: Equip with automatic gas shutoff device to shut off entire gas supply in event of excessive temperature in tank; and pilot safety shutoff.

D. Draft Hood: Equip with AGA certified draft hood.

E. Jacket: Insulate tank with vermin-proof glass fiber insulation. Provide outer steel jacket with baked enamel finish over bonderized undercoating.

F. Accessories: Provide brass drain valve; 3/4" pressure and temperature relief valve; and radiant floor shield.

G. Controls: Provide gas pressure regulator; pilot gas regulator; thermostat; and temperature limit control.

H. Manufacturers: Subject to compliance with requirements, provide commercial gas-fired water heaters of one of the following:
   1. A. O. Smith Corp. - Consumer Products Div.
   2. Lockinvar Water Heaters.
   3. American Water Heaters.
   4. Rheem Water Heater Div; City Investing Co.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which water heaters are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF WATER HEATERS

A. General: Install water heaters in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

B. Support: Place units on concrete pads, orient so controls and devices needing service and maintenance have adequate access.

C. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union. Extend relief valve discharge to closet floor drain, or as indicated.

D. Gages: Provide thermometers on inlet and outlet piping of water heaters, in accordance with Section "Meters and Gages."

E. Gas-Fired Water Heaters: Connect gas supply to gas line with drip let, tee, gas cock, and union; full size of unit inlet connection. Locate piping so as not to interfere with service of unit.

F. Flue: Connect flue to draft hood with gas-tight connection. Provide flue of minimum size as flue outlet on heater. Comply with gas utility requirements.

G. Electric Water Heaters:
   1. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
      a. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with water heater start-up until wiring installation is acceptable to water heater Installer.

3.03 FIELD QUALITY CONTROL

A. Start-Up: Start-up, test, and adjust gas-fired water heaters in accordance with manufacturer's start-up instructions, and utility company's requirements. Check and calibrate controls, adjust burner for maximum efficiency.

B. Start-Up: Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

END OF SECTION

SECTION 22 42 00
COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section specifies plumbing fixtures and trim. The types of fixtures specified include the following:
   1. Water Closets
   2. Urinals
   3. Lavatories (including wheelchair type)
   4. Service Sinks
   5. Drinking Fountains (including wheelchair type)
   6. Faucets
   7. Flush Valves
   8. Fixture Supports (including wheelchair type)
   9. Toilet Seats
   10. Fittings, Trim, and Accessories
   11. Floor Drains
   12. Roof Drains

1.02 RELATED SECTIONS

A. Separate grab bars and toilet accessories not in integral part of plumbing fixtures and are specified in Division 10.

B. Electrical Requirements for, Water Heaters, water conditioners, and other plumbing equipment are specified in other Sections of Division 22 and Division 26.

1.03 SUBMITTALS

A. Product Data: Submit Product Data and installation instructions for each fixture, faucet, specialties, accessories, and trim specified; clearly indicate rated capacities of selected models of water coolers, and water heaters.

B. Shop Drawings: Submit rough-in drawings. Detail dimensions, rough-in requirements, required clearances, and methods of assembly of components and anchorages. Coordinate requirements with Architectural Woodwork shop drawings specified in Division 06 for fixtures installed in countertops and cabinets. Furnish templates for use in woodwork shop.

C. Wiring Diagrams: Submit manufacturer's electrical requirements and wiring diagrams for power supply to units. Clearly differentiate between portions of wiring that are factory installed and field installed portions.

D. Maintenance Data: Include data in Maintenance Manual specified in Division 01 and Section 22 05 00.

E. Quality Control Submittals:
   1. Submit certification of compliance with specified ANSI, UL, and ASHRAE Standards.
   2. Submit certification of compliance with performance verification requirements specified in this Section.

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. California Building Code 2019, Title 24, Part 2 for Accessibility Requirements.
      a. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with **CBC Section 11B-213.2** shall comply with **CBC Section 11B-213.3**.
      b. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with **CBC Sections 11B-216.8 and 11B-703.7.2.6.3**. No pictogram, text or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of **CBC Section 11B-703**.

Examples of appropriate designations are “ALL-GENDER RESTROOM”, “RESTROOM” or “UNISEX RESTROOM”. **DSA BU 17-01**.

c. Accessible plumbing fixtures shall comply with all the requirements in **CBC Chapter 11B, Division 6**.

d. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per **CBC Section 11B-604.3.1**.

e. Heights and location of all accessible plumbing fixtures and components shall be mounted according to **CBC Section 11B-602 through 11B-612**.

f. Accessible fixture controls shall comply with **CBC Sections 11B-602.3** for drinking fountains, **11B-604.6** for water closets, **11B-604.9.5** for children’s water closets, **11B-605.4** for urinals, **11B-606.4** for lavatories and sinks, **11B-607.5** for bathtubs, **11B-608.5** for showers, and **11B-611.3** for washing machines and clothes dryers.

g. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34” maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with **CBC Section 11B-306** when a forward approach is required. **CBC Sections 11B-606.3 and 11B-606.7**.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store fixtures where environmental conditions are uniformly maintained within the manufacturer's recommended temperatures to prevent damage.

B. Store fixtures and trim in the manufacturer's original shipping containers. Do not stack containers or store in such a manner that may cause damage to the fixture or trim.

C. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per **CBC Section 11B-604.3.1.**

1.06 SEQUENCE AND SCHEDULING

A. Schedule rough-in installations with the installation of other building components.

1.07 MAINTENANCE

A. Extra Stock: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt in a quantity of one device for each 10 fixtures.

B. Repair Kits: Furnish faucet repair kits complete with all necessary washers, springs, pins, retainer packings, O-rings, sleeves, and seats in a quantity of 1 kit for each 40 faucets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer uniformity shall be as specified in Section 22 05 00: "Common Work Results for Plumbing."

B. The following specification mentions manufacturers to establish a standard quality. The following fixtures and accessories are acceptable, if used throughout:

1. Water Closets, Urinals, Lavatories, Service Sinks:
   a. American Standard
   b. Kohler Co.
2. Stainless Steel Sinks:
   a. Elkay Mfg. Co.
   b. Just Mfg. Co.
3. Faucets:
   a. Chicago Faucet Co.
   b. T & S Brass
   c. Speakman
4. Flush Valves:
   a. Sloan Valve Co.

5. Water Closet Seats:
   a. Church Products
   b. Bemis
   c. Beneke Corp
6. Fixture Supports:
   a. Jay R. Smith Manufacturing Co.
   b. Josam Mfg. Co.
   c. Zurn Industries, Inc.; Hydromechanics Div.
7. Drains:
   a. Jay R. Smith Manufacturing Co.
   b. Josam Mfg. Co.
   c. Zurn Industries, Inc.; Hydromechanics Div.

2.02 FIXTURES

A. Plumbing fixture trim and exposed supplies and wastes are to be brass with polished chromium plated finish unless otherwise specified. Provide individual lose key or screwdriver stops for all fixture supplies. Separately trap all wastes. Furnish chrome plated wall escutcheons for all exposed supplies and trap arms. Locate stops below fixtures or countertops. All fixtures for use by the disabled shall have exposed hot water pipe and tailpiece and trap insulated with 1/2" rubber foam insulation.

B. All plumbing fixture faucets submitted for review shall have identification label or certification showing compliance with California Title 24, Part 5, Article 1, "Energy Conservation Standards"; Article 1, T20-1406; Article 2, T20-1525 and Article 4, 1604, and 1606.

C. Provide fixtures as scheduled on plumbing drawings and requirements of this Section.

2.03 SINK FAUCET

A. Description: General Service faucet. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
   1. Maximum Flow Rate: 1.5 GPM.

2.04 LAVATORY FAUCET

A. Description: General Service faucet. Include hot- and cold-water indicators as occurs; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
   1. Maximum Flow Rate: 0.35 GPM.

2.05 FLUSHOMETER

A. Description: Flushometer for urinal and water-closet]-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.
   1. Consumption for Urinal: 0.125 gal./flush.
   2. Consumption for Water closet: 1.28 gal./flush.

2.06 WATER CLOSET

A. Description Accessible Wall-mounting, back-outlet, top-spud, vitreous-china fixture designed for flushometer valve operation.
   1. Style: Flushometer valve.
      a. Design Consumption: 1.28 gal./flush.

B. Description: Accessible Floor-mounting, floor-outlet, top-spud, vitreous-china fixture designed for flushometer valve operation.
   1. Style: Flushometer valve.
      a. Design Consumption: 1.28 gal./flush.

2.07 URINAL

A. Description: Accessible, Wall-mounting, back-outlet, top-spud, vitreous china fixture designed for flushometer valve operation.
   1. Design Consumption: 0.125 gal./flush.

2.08 FIXTURE SUPPORTS

A. Lavatory Supports: Adjustable cast iron, with thin concealed arms and sleeves, and complete with escutcheons and mounting fasteners.

B. Water Closet Supports: Adjustable, factory painted, cast iron face plate, support base, and appropriate type waste fitting having face plate gasket; zinc plated steel fixture studs and fasteners; coated and threaded adjustable wall coupling with neoprene closet outlet gasket; and chrome plated fixture cap nuts and fiber fixture washers. Provide an appropriate model to suit deep or shallow rough-in, siphon jet or blow-out water closet, and type of sanitary piping system to which it is connected.

C. Wheelchair Water Closet Supports: Adjustable, factory painted, cast iron face plate, support base, and appropriate type waste fitting having face plate gasket; zinc plated steel fixture studs and fasteners; coated and threaded adjustable wall coupling with neoprene closet outlet gasket; and chrome plated fixture cap nuts and fiber fixture washers. Units shall have elevated mounting heights of wheelchair fixtures, siphon jet or blow-out water closet, and type of sanitary piping system to which it is connected.

2.09 ESCUTCHEONS

A. Select one of the two options below:
   1. Chrome-plated cast brass with set screw.
   2. Chrome-plated sheet steel with friction clips.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify all dimensions by field measurements. Verify that all plumbing fixtures may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.

B. Examine rough-in for potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures.

C. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturer's written instructions, rough-in drawings, and pertinent codes and regulations, the original design, and the referenced standards.

B. Comply with the installation requirements of the 2019 California Building Code "CBC" Division 6 for accessible plumbing fixtures. Reference Article 1.04, A.,1., a. thru g. of this Section.

C. Fasten plumbing fixtures securely to supports or building structure. Secure supplies behind or within wall construction to provide rigid installation.

D. Securely attach wall hung fixtures to a 3/8 inch x 6 inch wide steel plate. Steel plate to extend at least one stud beyond first and last mounting point. Drill and tap plate at time of installation of fixture or fixture hanger. Support fixture hanger with 1/2" diameter threaded studs, jamb nuts, C.P. Acorn nuts and completely free of wall by means of a second set of jamb nuts. Weld plate to each metal stud crossed by means of a continuous vertical fillet weld and same size as stud thickness. Secure plate to each wood stud crossed by securely bolting to each stud crossed with two 1/2-inch steel bolts, 4-inch center with 1/8-inch maximum x 1-1/2 inch steel back up plates. Notch studs to set plate flush with surface.

E. Set mop basins in a leveling bed of cement grout.

F. Install a stop valve in an accessible location in the water connection to each fixture.

G. Install chrome plated brass escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and with cabinets and millwork.

H. Seal fixtures to walls and floors using silicone sealant as specified in Section 07 90 00. Match sealant color to fixture color.

I. Provide abrasive washers under all single drilling deck mounted trim.

3.03 INSTALLATION OF FLOOR DRAINS

A. Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

C. Set drain elevation depressed below finished slab elevation as listed below to provide proper slope to drain:

Depression (Inch)	Radius Of Area Drained (Feet)
1/2	5
3/4	10
1	15
1-1/4	20
1-1/2	25

D. Trap all drains connected to the sanitary sewer.

E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

F. Position drains so that they are accessible and easy to maintain.

3.04 INSTALLATION OF TRAP PRIMERS

A. Install trap primers with piping pitched towards drain trap, minimum of 1/8 inch per foot (1 percent). Adjust trap primer for proper flow.

3.05 INSTALLATION OF ROOF DRAINS

A. Install roof drains at low points of roof areas, in accordance with the roof membrane manufacturer's installation instructions.

B. Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.

C. Position roof drains so that they are accessible and easy to maintain.

3.06 FIELD QUALITY CONTROL

A. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.

B. Inspect each installed unit for damage. Replace damaged fixtures.

3.07 ADJUSTING

A. Adjust water pressure at drinking fountains, faucets, shower valves, and flush valves to provide proper flow and stream.

B. Replace washers or leaking or dripping faucets and stops.

C. Clean fixtures, trim, and strainers using manufacturer's recommended cleaning methods and materials.

3.08 CLEANING

A. Clean fixtures, trim, and strainers using manufacturer's recommended cleaning methods and materials.

3.09 PROTECTION

A. Provide protective covering for installed fixtures, water coolers, and trim.

B. Do not allow use of fixtures for temporary facilities unless expressly approved in writing by Owner.

3.10 MOUNTING HEIGHTS SCHEDULE

Fixture	Mounting Height
Water Closet	See Architectural Drawings
Accessible Water Closet	See Architectural Drawings
Urinal	See Architectural Drawings
Accessible Urinal	See Architectural Drawings
Lavatory or Sink	See Architectural Drawings
Accessible Lavatory / Sink	See Architectural Drawings
Accessible Water Cooler	See Architectural Drawings

3.11 ROUGH-IN FOR FIXTURES

A. Rough-in for all fixtures and/or equipment as shown on any drawings, including the architectural drawings, which forms a part of the contract documents. This shall include all fixtures and equipment shown and/or noted as N.I.C. (not in contract) or as U.O.S. (furnished under another section of the specification). Stub out all piping to the exact location of the fixtures and set symmetrical with the fixture. Stub out for fixture supply pipes with drop ear fittings secured to stud or backing plate. Stub out two pipe diameter and terminate with pipe cap. When liens are indicated as capped or plugged at floor level, plug flush with the finished floor.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Project specification Sections, apply to this and the other sections of Division 23.

B. This Division is an integrated whole comprising interrelated and interdependent Section and shall be considered in its entirety in determining requirements of the Work.

C. Refer to other sections of this Division for additional requirements or information regarding the subjects of this Section.

1.02 SECTION INCLUDES

A. This Section includes general administrative and procedural requirements for HVAC installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:
   1. Submittals.
   2. Coordination drawings.
   3. Record documents.
   4. Maintenance manuals.
   5. Rough-ins.
   6. Mechanical installations.
   7. Cutting and patching.

1.03 SUBMITTALS

A. General: Follow the procedures specified in Division 01.

B. HVAC submittals shall include shop drawings, product data, and samples per requirements of each section of specification

C. HVAC Submittals and Product Data: Assemble “submittals” and “product data” into tabbed brochures according to main areas of work i.e. (HVAC); Temperature Control; Testing, Adjusting, and Balancing.
   1. Assemble each brochure with tabbed separators for each Specification Section where products are noted to be submitted, with separate tabs for each product listed.
   2. Temperature "control shop drawings" may be submitted separately after preparations for review.
   3. For items such as valves, hangers and accessories, indicate specific items and where they are to be used.
   4. Contractor need only to submit for review those items specified to be submitted, unless requested by the Architect for special review.

D. All submittals shall be submitted in hard copy, electronic submittals are not acceptable.

E. Increase the number of HVAC related submittals including shop drawings, product data, and samples submitted to allow for required distribution by one additional copy, which will be retained by the Mechanical Consulting Engineer.

F. Submit for review, only the specific items required in this Section or other Sections of Division 23.

G. Additional submittals shall include, but not limited:
   1. Air balance reports and equipment data record drawings.
   2. Certification of completion of testing.
   3. Certification of completion of operation instructions.
   4. Operating instruction brochure.
   5. Maintenance instruction brochures.
   6. Equipment guarantees.

7. 1/4" = 1'-0" or larger scale layouts of "Equivalent" equipment or "Or Approved Equal" equipment.
8. Coordination Drawings, where requested or required.

H. Submittal materials will be reviewed for substantial conformity with the intent of the contract plans and specifications only. Such review does not indicate approval of dimensions, quantities, coordination with other trades, or work methods of the contractor, which are indicated thereon.

I. Additional copies may be required by individual sections of these specifications.

1.04 COORDINATION

A. The Contractor shall be totally responsible for coordinating the layout of all building elements to avoid conflict of the work of the structural, mechanical, electrical systems, and architectural features of the building.

B. The cost of any extra work of any kind caused by a conflict due to this lack of coordination shall be borne by the Contractor.

1.05 COORDINATION OF DRAWINGS

A. Prepare coordination drawings in accordance with requirements of Project Specification to a scale of 1/4" = 1'-0" or larger; detailing major elements, components, required clearances, and systems of HVAC equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of the installations are of importance to the efficient flow of the Work, including but not necessarily limited to the following:
   1. Indicate the proposed locations of piping, ductwork, equipment, and materials. Include the following:
      a. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
      b. Equipment for connections and support details.
   2. Prepare reflected ceiling plans to coordinate and integrate installations with other systems and components, such as, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

B. Submittal of "Or Equal" substitutions of equipment will not be reviewed unless accompanied by coordination drawings.

1.06 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements of project specification. In addition to the requirements of project specification, indicate the following installed conditions:
   1. Record drawings of all installed as specified in Division 01 the locations and invert elevations of underground installations.

1.07 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Project specification and Division 23 Section "Supplementary Mechanical Requirements."

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, mill certification, and other information needed for identification.

1.09 EQUIVALENT EQUIPMENT

A. In these specification and drawings, whenever more than one (1) manufacturer's product is specified, the manufacturer specified on the drawings and the first named product in these specifications is the basis of design and the use of alternate-named manufacturer's product or substitutes may require modification in the design work and agency approvals. If such alternatives or substitutions are proposed by the contractor, contractor shall adhere to the following requirements:

1. Contractor shall clearly identify all proposed alternatives or substitutions in the submittal package.
2. The Contractor shall assume all costs required to make all necessary revisions and modifications of the contract documents resulting from the substitution or selection of an alternate manufacturer's product, including all professional fees and the cost of DSA approval.
3. The Contractor shall assume all costs required for any additional modification to building structure, electrical and all other related construction costs resulting from the substitution or selection of an alternate manufacturer's product.

B. These specifications and/or drawings, names and specifies certain equipment in detail which are the basis of design and are explained in paragraph 1.09-A above. It also names alternate equipment by manufacturer, which is not considered to be a "substitution."

C. Submit equivalent equipment to the Architect for review per the requirements of Division 01, and Section "Common Work Results for HVAC."

D. Equipment of Manufacturers named in Division 23 will be considered equivalent to that specified in detail and/or named on the drawings if:
1. The proposed equipment is of equivalent quality, capacity.
2. Equipment is as fully equipped, fits the space allotted, and has physical configuration and weight similar-to the equipment specified in detail.

E. A complete lay out of an equipment room or area must be submitted for equivalent equipment. Notice space limitations. Layouts to include plans and section views at a scale of not less than 1/4" = 1 ft.

F. The Architect shall determine the acceptability of "Equivalent Equipment."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 ROUGH-IN

A. Verify final locations for rough-in with field measurements and with the requirements of the actual equipment to be connected.

3.02 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of HVAC systems, materials, and equipment. Comply with the following requirements:
1. Coordinate HVAC systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for HVAC installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of HVAC materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible as required by California Building Code.
7. Coordinate connection of HVAC system with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect prior to commencement of installation.
9. Install systems, materials, and equipment level and plumb, parallel, and perpendicular to other building systems and components.
10. Install all HVAC equipment to facilitate servicing, maintenance, and repair or replacement of equipment components in full compliance with California Building Code and the equipment manufacturer's recommendations. If the drawings or the manufacturer does not provide a specific space requirement for servicing equipment, provide as a minimum, horizontal distance of 36" from face of equipment to opposite vertical surface.
11. Install access panels or doors for all equipment and components which require access for adjustment and maintenance, where units are concealed behind finished surfaces.
12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
13. Any equipment located above a ceiling that has any component, which is serviceable shall be installed within 12" of the top-of the ceiling.

3.03 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with project specification. In addition to the requirements specified in project specification, the following requirements apply:
   1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of HVAC equipment and materials required to:
   1. Uncover Work to provide for installation of ill-timed Work.
   2. Remove and replace defective work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.
   5. Install equipment and materials in existing structures.
   6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

C. Cut, remove, and legally dispose of selected HVAC equipment, components, and materials as indicated, including but not limited to removal of HVAC piping, refrigerant lines, heating units, and other HVAC items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
   1. Patch existing finished surfaces and building components using experienced installers and new materials matching existing materials. For installer’s qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION

SECTION 23 05 11
SUPPLEMENTARY HVAC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies supplementary requirements for HVAC installations and includes requirements common to more than one section of Division 23. It expands and supplements the requirements specified in Section 23 05 00 "Common Work Results for HVAC."

1.02 DESCRIPTION

A. Provide a complete and operable installation, including all labor, supervision, materials, equipment, tools, apparatus, transportation, warehousing, rigging, scaffolding and other equipment and services necessary to accomplish the work in accordance with the intent and meaning of these drawings and specifications.

1.03 COORDINATION

A. Coordination of the work is the responsibility of the Contractor.

B. Contractor shall designate an individual competent and versed in the HVAC trades to coordinate the HVAC work with the work of other trades.

1.04 DEFINITIONS (AS USED ON DIVISION 23 DRAWINGS AND HEREIN)

A. "Provide" means furnish, install, and connect unless otherwise described in specific instances.

B. "Piping" means pipes, fittings, valves, and all like pipe accessories connected thereto.

C. "Ductwork" means ducts, plenums, compartments, or casings including the building structure, which are used to convey or contain air.

D. "Extend", "Submit", "Repair" and similar words mean that the Contractor (or his designated subcontractor) shall accomplish the action described.

E. "Codes" or "Code" means all codes, laws, statutes, rules, regulations, ordinances, orders, decrees, and other requirements of all legally constituted authorities and public utility franchise holders having jurisdiction.

F. "Products", "Materials" and "Equipment" are used interchangeably and mean materials, fixtures, equipment, accessories, etc.

G. "Utility Areas" are defined as mechanical, electrical, janitorial, and similar rooms or spaces which are normally used or occupied only by custodial or maintenance personnel. "Public Areas" are defined as the rooms or spaces, which are not included in the utility areas definition.

H. "Building Boundary" includes concrete walkways immediately adjacent to the building structure.

I. "Below Grade" means buried in the ground.

J. "Substantial Completion" means all components of all systems are functioning but lacking in final adjustment.

K. Pressure rating specified (such as for valves and the like) means design working pressure for and with references to the fluid, which the device will serve.

1.05 RELATED WORK

A. Coordination: Refer to Architectural, HVAC, Plumbing, Civil, Structural, and Electrical Drawings for the construction details and coordinate the work of this Division with that of other Divisions. Order the work of this Division so that progress will harmonize with that of other Divisions and all work will proceed expeditiously. The work of this Division shall include direct responsibility for the correct placing and connection of HVAC work in relation to the work of other Divisions.

B. Examine other Divisions for work related to the Work of this Division, especially Divisions 22 & 26.

1.06 EXISTING CONDITIONS

A. Visit the site prior to bidding and investigate the existing conditions, which affect or will be affected by the work of this Division. Become thoroughly familiar with the working conditions and take into-account any special or unusual features peculiar to this job. By the act of submitting a Bid, the Contractor will be deemed to have complied with the foregoing, to have accepted such conditions, and to have made allowance therefore in preparing his Bid.

B. The locations of existing concealed utility lines are shown in accordance with reference data received by the Architect. The Architect does not guarantee the accuracy of such data. The points of connection are therefore approximate, and the Bidder shall include adequate funds in his Bid to cover costs of connection regardless of their exact location.

C. Exercise extreme caution during trenching operations. Repair the damage caused by such operations to the existing utility lines, at no cost to the Owner, whether the lines are shown on drawings or not.

1.07 DRAWINGS AND SPECIFICATIONS

A. These drawings and specification do not include necessary components for construction safety.

B. All provisions shall be deemed mandatory except as expressly indicated as optional by the word "may" or "option".

C. Except where dimensioned, the drawings relating to this division are a diagrammatic presentation of the design concept, which indicates the general area where piping and ductwork is to be run. The drawings do not necessarily indicate any, and all offsets and configurations required for coordination with other trades. The contractor is responsible for the correct placing of his work, and the proper location and connection of his work in relation to the work or other trades.

1.08 PERMITS AND INSPECTIONS

A. Obtain, schedule, and pay for permits, licenses, approvals, tests, and inspections required by legally constituted authorities and public utility franchise holders having jurisdiction over the work.

B. Afford the Architect's representative every facility for evaluating the skill and competence of the mechanics and to examine the materials. Concealed work shall be reopened when so directed during his periodic visits.

1.09 CODES AND REGULATIONS

A. By submitting a Bid, Contractor is deemed to represent himself as competent to accomplish the work of this Division in conformance with applicable Codes. In case of conflict between the Contract Documents and Code requirements, the Codes shall take precedence. Should such conflicts appear, cease work on the parts of the contract affected and immediately notify the Architect in writing. It shall be the Contractor's responsibility to correct, at no cost to the Owner, any work he executes in violation of Code requirements. Specific references to codes elsewhere in this Division are either to aid the Contractor in locating applicable information or to deny him permission to use options, which are permitted by Codes.

B. Applicable Codes: (Current editions unless otherwise noted).
   1. All local codes; city and/or county as applicable.
   2. OSHA requirements.
   3. California Building Code.
   4. California Code of Regulations (CCR) Titles (as applicable).
   5. Fire Marshal Regulations.
   6. State, County, City Health Department Ordinances and Regulations.
   7. Regulations of all other authorities having jurisdiction.
   8. California Mechanical Code.
   9. California Plumbing Code.

C. Where conflict or variation exists amongst Codes, the most stringent shall govern.

1.10 RECORD AND DOCUMENTATION

A. Accumulate the following and deliver to the Owner's representative prior to final acceptance of the work.
   1. Record (As-Built) Drawings:
      a. Maintain in good order in the field office a complete set of prints for all work being done under Division 23. Update the drawings daily with neat and legible annotations in red ink showing the work as actually installed.
      b. The actual size, location and elevation of all buried lines, valve boxes, manholes, monuments, and stub-outs shall be accurately located and dimensioned from building walls or other permanent landmarks.
      c. Furnish the original marked up AS-Built drawings and an electronic copy in AutoCAD-14 format.
   2. Operation and Maintenance Manual: Furnish an operation and maintenance manual covering the stipulated HVAC systems and equipment. Seven copies of the manual, bond in hardback binders or an approved equivalent shall be provided to the Architect.
   3. Furnish one complete manual prior to the time that system or equipment tests are performed.
   4. Furnish the remaining manuals before the contract is completed.
   5. The following identification shall be inscribed on the cover:

      OPERATION AND MAINTENANCE MANUAL

      PROJECT TITLE . . . . . .

      CONTRACTOR NAME & CONTACT INFORMATION

   6. Provide a Table of Contents.
      a. Insert tab sheets to identify discrete subjects.
      b. Instruction sheets shall be legible and easily understood, with large sheets of drawings folded in.
      c. The manual shall be complete in all respects for all materials, piping, valves, devices and equipment, controls, accessories, and appurtenances stipulated. Include as a minimum the following:
         1) Updated approved materials lists, shop drawings and catalog information of all items of HVAC system equipment.
         2) System layout showing piping, valves, and controls.
         3) Wiring and control diagrams with data to explain detailed operation and control of each component.
         4) A control sequence describing start-up, operation, and shutdown.
         5) Detailed description of the function of each principal component of the system.
         6) Procedure for starting.
         7) Procedure for operating.
         8) Shut-down instructions.
         9) Installation instructions.
         10) Adjustments, maintenance, and overhaul instructions.
         11) Lubrication schedule including type, grade, temperature range and frequency.
         12) Safety precautions, diagrams, and illustrations.
         13) Test procedures.
         14) Performance data.
         15) Parts list, with manufacturer's names and catalog numbers.
         16) Preventive maintenance schedule.
         17) Service organization with name, address, and telephone number.
         18) Valve identification chart and schedule.
         19) ASME certificates.
         20) Air balance report.
         21) Hydronic balance report.

B. Standards Compliance: Where equipment or materials are specified to conform to requirements of standards of recognized technical or industrial organizations such as American National Standards Institute (ANSI) American Society for Mechanical Engineers (ASME) American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), American Society for Testing Materials (ASTM), Underwriters Laboratories (UL), American Gas Association (AGA), American Refrigeration Institute (ARI), or National Electrical Manufacturer's Association (NEMA), that use a label or published listing as a method of indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence.

C. Certificates of Conformance or Compliance: Submit original and not pre-printed certifications. Do not make statements in the certifications that could be interpreted to imply that the product does not meet all requirements.

D. Certified Test Reports: Certified Test Reports are reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use. Before delivery of materials and equipment, submit certified copies of test reports specified in the individual sections.

E. Factory Tests: Factory tests are tests, which are required to be performed on the actual materials or equipment, proposed for use. Submit results of the tests in accordance with the requirements for laboratory test results of this Contract.

F. Permits and Certificates of Inspection: Furnish the originals.

G. Testing procedures and test results required in this and other sections. Furnish 2 copies.

H. Other data required by other sections of this Division. Furnish 2 copies.

1.11 CONSTRUCTION COST BREAKDOWN

A. Prepare and submit for review a construction cost breakdown for the major subdivisions of the HVAC work in accordance with General and Supplemental Conditions and Project Specification.

B. Subdivide each item on the breakdown into two headings: labor and materials. Include overhead and profit in each entry.

C. Submit one copy of the breakdown directly to the Engineer and the remaining copies sent through regular channels.

1.12 TOOLS

A. Provide all special tools needed for proper operation and routine adjustment and maintenance of systems and equipment. Deliver tools to Owner's representative and request a receipt for same.

1.13 WARRANTIES

A. Refer to Project Specification for procedures and submittal requirements for warranties. Refer to individual equipment specifications for warranty requirements.

B. Where periods more than one year are specified in the specifications, such longer periods shall govern. However, when any component fails at any time during this period, the warranty period for such component and all other components, which are inactive because of, said failure shall be suspended. The warranty period for such components shall resume to-run for the remaining portion of the warranty period when failed component is completely repaired and in operation; however, in no case shall the resumed portion of the warranty period be less than 3 months in duration.

C. Neither payment for work, nor total or partial occupancy of work by the Owner, within or prior to the warranty period specified, shall be construed as acceptance of faulty work, or shall condone any negligence or omission of Contractor in doing the work.

D. Compile and assemble the warranties specified in Division 23, into a separated set of vinyl covered, three ring binders, tabulated, and indexed for easy reference.

E. Provide complete warranty information for each item to include product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names and addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

1.14 SEISMIC RESTRAINT

A. Provide seismic restraint for HVAC equipment, piping, and ductwork.

B. Contractor shall submit certification of suitability of seismic restraint methods signed by Licensed Structural Engineer registered in State of California.

C. Contractor may refer to details applicable in the SMACNA, "GUIDELINES FOR SEISMIC RESTRAINT OF HVAC SYSTEMS", using the 'g' forces for "other buildings" classification CCR Title 24 all such details shall be DSA approved. Deliver a copy of these Guidelines to the Owner's Resident Inspector.

1.15 SYSTEM OPERATIONAL TESTS

A. The Contractor shall inform the Owner one week prior to start of testing in order that the Owner's representative may be present.

B. After balancing and prior to final inspection, the contractor shall operate all systems continuously trouble free and stable for a minimum period of fourteen (14) consecutive days including Saturday and Sunday. Each day shall be a minimum of an 8-hour day. Should a problem arise, the fourteen (14) day period shall be restarted and repeated until successfully operated for full 14 days. A written report certified by the Owner's representative shall indicate the successful completion of a stable and trouble free 14-day period.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Standard Products: Materials and equipment shall be essentially the standard cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be their latest standard designs that comply with the specification requirements.

B. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening, unless more stringent requirements are specified. Where two or more units of the same type of equipment are required, these units shall be products of a single manufacturer. The components thereof, however, are not required to be exclusively of the same manufacturer.

C. Each major component of equipment shall have manufacturer's name, address, model, and serial number on a nameplate securely affixed in a conspicuous place. The nameplate of the distributing agent will not be acceptable.

D. In these specification and drawings, whenever more than one (1) manufacturer’s product is specified, the manufacturer specified on the drawings and the first named product in these specifications is the basis of design and the use of alternate-named manufacturer’s product or substitutes shall comply with the requirements of Section 23 05 00.

2.02 PRODUCT LISTING

A. When two or more items of same material or equipment are required (pipe and fittings, pumps, valves, air conditioning units, etc.) they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, sheet metal, wire, steel bar stock, welding rods, solder, fasteners, and similar items used in Work, except as otherwise indicated.

2.03 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated HVAC equipment, indicating manufacturer, product name, model name, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

2.04 SUBSTITUTIONS

A. General: Submittals of "Substitutions" shall be in accordance with requirements of Division 01.

B. By proposing a-substitution it is deemed that the Contractor shall bear the cost of any, and all design and construction changes (whether architectural, structural, electrical, HVAC and Plumbing) necessary to accommodate the substitution, if said substitution is accepted.

C. Specific: Refer to Specification Sections 23 05 00 & 23 05 12 for additional requirements.

2.05 SUBMITTALS

A. General: Make submittals in accordance with requirements of Division 01.

B. Specific: Refer to Specification Sections 23 05 00 for additional requirements.

PART 3 - EXECUTION

3.01 WORKMANSHIP AND INSTALLATION METHODS

A. Workmanship shall be in the best standard practice of the trade.

B. Install equipment in accordance with the manufacturer's instructions and recommendations unless otherwise noted or specified.

3.02 TESTS

A. General:
   1. Demonstrate that all components of the work of this Division have been provided and that they operate in accordance with the Contract Documents.
   2. Provide instruments and personnel for tests and demonstrations. Submit signed test results.

B. Specific: Refer to the other sections of this Division for test requirements.

3.03 DELIVERY, HANDLING, STORAGE OF MATERIALS AND PROTECTION OF WORK

A. Protect materials against dirt, water, chemical and mechanical damages both while in storage and during construction.

B. Cover materials in such a manner that no finished surfaces will be damaged, marred or splattered with plaster or paint, and all moving parts will be kept clean and dry.

C. Replace or refinish any damaged materials including fronts of control panels, ductwork fittings, and shop-fabricated ductwork.

D. Air distribution systems shall be aggressively protected from dust during the construction process to ensure that no contamination of the duct system occurs.

E. The use of permanently installed AHUs and associated air distribution systems for temporary heating and cooling during construction is prohibited.

F. Keep cabinets and other openings closed to prevent entry of foreign matter.

G. Specific: Refer to other sections of this Division for additional requirements.

3.04 PROJECT CONDITIONS

A. Check and coordinate for clearance, accessibility, and placement of equipment either by going through openings provided or by placing equipment during construction. Ordering of equipment to be shipped disassembled, or disassembly of equipment at Project Site and reassembly of equipment to accomplish this requirement shall be executed without additional cost. Where provided openings are inadequate to accommodate equipment, provide new openings and restoration of same, all at no additional cost. Obtain written approval for new openings before proceeding.

B. Verify location of all equipment within finished spaces with the Architectural Drawings. In the event, that HVAC drawings do not indicate exact locations, or are in conflict, with the Architectural drawings, obtain information regarding proper locations. Installation of work without proper instruction under such circumstances will result in relocation of work, when directed, without additional cost.

3.05 INSTRUCTION TO OWNER PERSONNEL

A. Contractor shall furnish, without additional expense to the Owner, the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the equipment or system specified. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance of work. Instruction shall be given at the Owner's convenience. The number of man-days (eight-hours) of instruction furnished shall be as specified in other sections. When more than four man-days of instruction are specified, approximately half of the time shall be used for classroom instruction. All other time shall be used for instruction with the equipment or system. When significant changes or modifications are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.

B. Contractor shall videotape, both visual and audio, instruction to Owner's personnel on the maintenance and operation of the HVAC systems.

C. Submit certification, signed by Owner's agent that instructions have been completed and the videotape has been reviewed and delivered to the Owner.

D. Printed operating instructions and a copy of wiring diagrams are to be mounted in all equipment areas, framed and behind glass or encased in plastic. Printed operating instructions shall include steps for starting up and securing equipment. As a precedent to final acceptance four (4) copies of instructions are to be submitted to the Architect for review. Contractor shall turn over to Owner in a neat brochure form, equipment-guarantee, and maintenance instructions.

3.06 CLEANING

A. Cleaning shall be done as the work proceeds. Periodically remove waste and debris to keep the site as clean as is practical.

B. Refer the Division 01 for general requirements for cleaning.

C. Leave exposed parts of the HVAC work in a neat, clean, and usable condition, with painted surfaces unblemished and plated metal surfaces polished.

D. Thoroughly clean all materials, equipment, and appliances. Clean and prepare all surfaces to be painted. Clean the entire premises of unused materials, debris, spots, and marks to the satisfaction of the Architect.

E. Remove, thoroughly clean, and replace all strainers and automatic valves after the system has been put in operation until system is clear of all foreign matter and repeat this operation after ten (10) days and again after the system has been in operation thirty (30) days. Submit certification that this operation has been completed.

3.07 SAFETY REQUIREMENTS

A. Enclose and guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts in accordance with OSHA requirements. Insulate, guard, and cover any high-temperature equipment and piping so located as to endanger personnel or create a fire hazard.

END OF SECTION

SECTION 23 05 12
HVAC PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for handling requests made after award of the Contract for substitutions of products specified in Division 23.

1.02 RELATED SECTIONS

A. Procedure for Contractor's construction Schedule and the Schedule of Submittals are included under Division 01.

B. Standards: Refer to Division 01 for applicability of industry standards to products specified.

C. Procedural requirements governing the Contractor's selection of products and product options are included under Division 01.

D. Refer to Division 01 for Products and Substitutions.

E. Refer to Sections 23 05 00 & 23 05 11 for additional requirements.

1.03 DEFINITIONS

A. "Products" is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. "Materials" is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work.

B. "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in contract documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

1.04 SUBSTITUTIONS

A. The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to contract documents, where requested by Owner, Architect or Engineer, are "changes" not "substitutions". Substitutions requested during bidding period, which have been accepted prior to Contract Date, are included in contract document and are not subject to requirements for substitutions as specified herein. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions"; and do not constitute a basis for change orders, except as provided for in contract documents. Otherwise, contractor's requests of changes in products, materials and methods of construction required by contract documents are considered requests for "substitutions" and are subject to requirements hereof.

B. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise, requests will be returned without action except to record noncompliance with these requirements.
   1. Extensive revisions to Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of Contract Documents.
   3. The request is directly related to an "or approved equal" clause or similar language in the Contract Documents.
   4. All costs required to make all necessary revisions and modifications to the contract documents resulting from the substitution, including but not limited to, all professional fees and the cost of DSA approval will be the Contractor’s responsibility.

5. All costs required to make all necessary revisions and modifications to the building structure, electrical and all other related construction costs resulting from the substitution, including but not limited to, material, products, equipment, testing, and inspection will be the Contractor's responsibility.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.
8. Contractor certifies that the substitution is not heavier than the specified item and does not necessitate any structural and electrical redesign; will fit within the room or area designed for the specified item; and will not exceed any maximum dimensions specified or shown on the original contract Documents.
9. All roof mounted equipment must be less than or equal to the maximum height dimension from the finished roof as shown on the drawings.
10. Contractor represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
11. Contractor represents that he will provide the same warranty for the substitution that he would for that specified.

1.05 SUBMITTALS

A. Requests for Substitutions: Any request for substitution shall follow the guidelines of Substitution Requirements in Division 01, Section 23 05 00 & 23 05 11.

B. Substitution Warranty: All submittals of Request for Substitutions under the General and Supplementary Conditions of this Section shall be accompanied by a completely executed (filled out) and signed Substitution Warranty in the form entitled "Substitution Warranty", bound herein. Substitutions will not be accepted without the Substitution Warranty. In addition to other requirements, Contractor shall warrant in writing on his own letterhead that substituted materials shall perform as specified, and assume complete responsibility for same, including responsibility and costs required for modifications to building or other materials or equipment, and any additional coordination with work of other trades. Testing, if required, shall be paid by Contractor.

C. Responsibility of Contractor: The contractor shall be solely and directly responsible for fitting accepted substitute material and equipment into the available space in a manner acceptable to the Architect, and for the proper operation of the substituted equipment with all other equipment with which it may be associated. The Contractor shall bear all costs of meeting the above requirements for presenting a proposed substitution, and if the substitution is accepted, he must bear all costs involved.

D. Submit the following as part of the Request for Substitutions:
   1. Data showing proposed equipment is "equal" to that specified and is fully equipped, fits the space allotted and has physical configuration and weight similar-to the equipment specified in detail.
   2. A complete layout, where applicable, of equipment room or area must be submitted for equipment proposed in "Request for Substitution". Submittal shall conform to requirements of Division 01 and Section 23 05 00 "Common Work Results for HVAC" as it applies to "Coordination Drawings."
   3. Seismic Restraint: Where seismic restraint is required for products or equipment as specified, methods of seismic restraint signed by licensed Structural Engineer registered in the State of California, shall be submitted for review to the Division of the State Architect.

1.06 ARCHITECT'S ACTION

A. The Architect may request additional information or documentation necessary for evaluation of the request. Requests, by the Architect, for additional information or documentation will be in accordance with Division 01 requirements. The Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, Contractor shall use the “Bases of Design” product specified by name in the contract documents. Acceptance will be in the form of a Change Order.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Substitutions shall conform to the product requirements for the specified products or equipment.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SAMPLE

S U B S T I T U T I O N S W A R R A N T Y

In addition to other requirements, Contractor shall warrant in writing that substituted materials shall perform as specified, and assume complete responsibility for same, including responsibility and costs required for modifications to building or other materials or equipment, and any additional coordination with work of other trades. Testing, if required, shall be paid by contractor. The following is an example of the type of Substitution Warranty which shall be executed by the Contractor, on his own letterhead:

SUBSTITUTION WARRANTY
We propose to provide

_____
(Describe items being proposed for substitution)

for_____ in lieu of
(List project name)

as indicated on the drawings and described in Section _____ of the Specifications.

We agree to assume the cost of any, and all modifications to the Contract Documents and to other portions of the work as indicated in the Specification Sections 23 05 00, 23 05 11, & 23 05 12, and as necessary to accommodate for substituted material(s) and system(s) as indicated in this letter of “Substitution Warranty.”

We hereby warrant that _____
(Provide Description)

is the equivalent of _____
(Specified Product)

in every respect and will perform satisfactorily under the conditions and use indicated on the Drawings and described in the Specifications.

Signed: _____ Date: _____
(Manufacturer/Supplier)

Signed: _____ Date: _____
(Subcontractor)

Signed: _____ Date: _____
(Contractor)

NOTE: Affix Corporate Seal over Signatures.

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the basic requirements for electrical components, which are an integral part of packaged HVAC equipment. These components include, but are not limited to factory-installed motors, starters, and disconnect switches furnished as an integral part of packaged HVACequipment.

B. Specific electrical requirements (i.e., horsepower and electrical characteristics) for HVAC equipment are scheduled on Drawings.

C. All motors, power driven equipment and automatic control equipment, except motor starters as hereinafter set forth required and connected with the work of this section of the specifications are to be furnished and installed under Division 23.

D. Control low (24V) and control line (120V) voltage wiring, conduit and related switches and relays required for the automatic control and/or interlock of motors and equipment includes final connection, are to be furnished and installed under Division 23. Materials and installation to conform to Class 1 or 2, CAC Title 24, Article E725, and as restricted under Division 26 of these specifications.

E. Power wiring, conduit, outlets, disconnect switches, motor starters and motor-rated contactors, and making of final connections, except as hereinafter specified, are to be furnished and installed under the Division 26 of these Specification.

F. All power supply wiring for providing a power source to control dampers, control valves, VAV boxes, control transformers, etc., shall be furnished and installed under Division 23.

G. Identify circuits and equipment as outlined in the Electrical Sections of these Specifications.

H. Coordinate requirements for underground conduit only between buildings for control interlocks shown on the drawings. This conduit to be furnished and installed under Division 26 of these Specifications.

I. Space provisions have been made on electrical panels for control power source.

1.02 RELATED SECTIONS

A. Separate electrical components and materials required for field installation and electrical connections are specified in Division 26.

B. This section applies to all Division 23 sections specifying packaged HVAC equipment.

1.03 REFERENCES

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standards ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. Comply with National Electrical Code (NFPA 70).

1.04 SUBMITTALS

A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.05 QUALITY ASSURANCE

A. Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.01 MOTORS

A. Provide all motors necessary for equipment under the HVAC Work. See Electrical Drawings for voltage and phase of electrical services.

B. The following are basis requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
   1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
   2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
   3. 2-speed motors shall have 2 separate windings on poly-phase motors.
   4. Temperature Rating: As a minimum, motors shall be rated for 40 degree C environment with maximum 50 degree C temperature rise for continuous duty at full load (Class A Insulation).
   5. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
   6. Service Factor: 1.23 for poly-phase motors and 1.35 for single-phase motors.
   7. Motor construction: NEMA Standard MG 1, general purpose, continuous duty, deign "B", except "C" where required for high starting torque.
      a. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
      b. Bearings:
         1) Ball or roller bearings with inner and outer shaft seals.
         2) Re-greasable bearings, except permanently sealed where motor is normally inaccessible for regular maintenance.
         3) Bearings designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.
         4) Bearings for fractional horsepower, light duty motors, sleeve type bearings are permitted.
      c. Enclosure Type:
         1) Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
         2) Guarded drip-proof motors where exposed to contact by employees or building occupants.
         3) Weather protected Type I for outdoor use, Type II where not housed (Epoxy encapsulated or TEFC).
      d. Overload protection: Polyphase built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter. Single phase, provide thermal overload protection.
      e. Noise rating: "Quiet".
      f. Efficiencies shall be guaranteed minimum values in accordance with the following tabulation. Efficiencies shall be established in accordance with NEMA Test Standards MG1-12.53A using IEEE Test Procedure 112, Method B:

HP	EFFICIENCY
1 - 2	81.5
3 – 5	86.5
7-1/2 - 10	90.6
15 - 30	92.0

      g. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
      h. Provide all motors with junction boxes or terminals boxes and provide adjustable slide rails for all motors with belt drives.

i. Motors rated 1 HP and larger shall have shaft, bearings and etc. capable of operating with multiple grooved sheaves and two or more belts.
j. V Type Belt Drives: Drives requiring not more than 2 belts; variable pitch type; size for mid-point of operating range. Drives requiring 3 or more belts; nonadjustable constant speed type. Provide belts in matched sets.

2.02 MOTOR STARTERS

A. Unless provided as part of packaged HVAC equipment or otherwise indicated, starters for motors will be provided under Division 26. Provide to Division 26 the data necessary for motor starter heater sizing for all motors.

B. Starters for factory packaged HVAC equipment specified under Division 23 shall be provided as part of the package.

C. Motor Starter Characteristics:
1. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations, which shall have NEC proper class and division.
2. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.

D. Manual switches shall have:
1. Pilot lights and extra positions for multi-speed motors.
2. Overload protection: melting alloy type thermal overload relays.

E. Magnetic Starters:
1. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
2. Trip-free thermal overload relays, each phase.
3. Interlocks, switches, and similar devices as required for coordination with control requirements.
4. Built-in control circuit transformer, fused from line side, where service exceeds 240 volts.
5. Externally operated manual reset.
6. Under-voltage release or protection.

F. Motor Connections:
1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

2.03 DISCONNECT SWITCHES

A. When applied as part of factory furnished and mounted equipment, disconnects shall meet the requirements for disconnect switches set forth in Division 26.

PART 3 - EXECUTION

3.01 SEISMIC RESTRAINT

A. All electrical devices shall be seismically restrained.

END OF SECTION

SECTION 23 05 15
ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes limited scope of general construction materials and methods for access doors and panels in walls and ceilings for access to HVAC materials.

B. Requirements of access doors are outlined in Division 08.

C. Access doors and panels are required for all HVAC equipment requiring maintenance, inspection, adjustment, monitoring, etc… which are installed in inaccessible areas such as behind walls, above ceiling, under floor, etc.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of access door or panel.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer Qualifications: Engage an experienced Installer for the installation of access panels and doors.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
   1. Elmdor / Stoneman.
   2. Jay R. Smith Mfg. Co.
   3. Milcor Inc.

2.02 ACCESS DOORS

A. Steel Access Doors and Frames: Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

B. Frames: 16-gage steel, with a 1-inch-wide exposed perimeter flange.
   1. For installation in masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling: 1 inch-wide-exposed perimeter flange and adjustable metal masonry anchors.
   2. For gypsum wallboard or plaster: perforated flanges with wallboard bead.
   3. For full-bed plaster applications: galvanized expanded metal lath and exposed casing bead, welded to perimeter frame.

C. Flush Panel Doors: 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.
   1. Fire-Rated Units: Insulated flush panel doors, with continuous piano hinge and self-closing mechanism.

D. Locking Devices: Flush, screwdriver-operated cam locks.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which access door and panel products are to be installed. Do not proceed with work until unsatisfactory conditions have been in manner acceptable to Installer.

3.02 APPLICATION

A. Nonrated Walls and Ceilings: Prime coat finish door and frame, Allen key latch face of wall type; Smith 4760, Elmdor / Stoneman DW Series.

B. Fire Rated Walls and Ceilings: "B" Labeled U.L. 1-1/2 hours, prime coat finish door and frame, flush keyed cylinder lock; Milcor.

C. Tile Walls: Cover and frame 18-8 satin stainless steel, face-of-wall type, vandal resistant screws; J. R. Smith 4762, Elmdor / Stoneman DW Series.

3.03 INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.

3.04 COORDINATION

A. General: Coordinate locations of ceilings access doors with lights, air outlets, speakers, etc. Submit drawings showing relative locations of doors to other ceiling items for acceptance by the Architect prior to installation. Transparencies of floor plans and/or reflected ceiling plans will be available from the Architect for this purpose.

B. Location: Doors may be located to serve more than one item where feasible, providing they are approved as specified. Sizes suitable for purpose intended, with 12" x 12" minimum.

C. Access doors and panels not required in accessible ceiling systems where direct access to HVAC items is possible.

END OF SECTION

SECTION 23 05 29
SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of supports and anchors required by this section is indicated on drawings or in other Division 23 sections and include the following:
   1. Horizontal-Piping Hangers and Supports.
   2. Vertical-Piping Clamps.
   3. Hanger-Rod Attachments.
   4. Building Attachments.
   5. Saddles and Shields.
   6. Miscellaneous Materials.
   7. Anchors.
   8. Equipment Supports.

1.02 RELATED SECTIONS

A. This section is part of each Division 23 section making reference to or requiring supports and anchors specified herein.

B. Supports and anchors furnished as part of factory fabricated equipment are specified as part of equipment assembly in other Division 23 sections.

C. Section 03 30 00: Cast-in-Place Concrete.

1.03 QUALITY ASSURANCE

A. Codes and Standards:
   1. Code Compliance: Comply with applicable plumbing codes pertaining to product materials and installation of supports and anchors.
   2. UL and FM Compliance: Provide products which are UL-Listed and FM approved.
   3. MSS Standard Compliance:
      a. Provide pipe hangers and supports of which materials, design, and manufacturer comply with MSS SP-58.
      b. Select and apply pipe hangers and supports, complying with MSS SP-69.
      c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
      d. Terminology used in this section is defined in MSS SP-90.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58.
   1. Components shall have galvanized coatings where installed for piping and equipment that will not have field-applied finish.
   2. Pipe attachments shall have nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal Hanger Shield Inserts: 100 PSI average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

2.02 HORIZONTAL PIPING HANGERS AND SUPPORTS

A. General: Except as otherwise indicated, provide factory fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. 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 copper-piping systems.
   1. Adjustable Steel Clevis Hangers: MSS Type 1.
   2. Adjustable Swivel Pipe Rings: MSS Type 6.

2.03 VERTICAL PIPING CLAMPS

A. General: Except as otherwise indicated, provide factory fabricated vertical-piping clamps complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

B. Two-Bolt Riser Clamps: MSS Type 8.

2.04 HANGER ROD AND BUILDING ATTACHMENTS

A. General Hanger Rod Attachment: Refer to structural drawings for requirements of hanger rod and building attachments. If a specific attachment that is required is not detailed on the structural drawings, one of the following attachments may be submitted for review by the structural engineer prior to installation. Except as otherwise indicated, provide factory fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

B. General Building Attachment: Except as otherwise indicated, provide factory fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
   1. Concrete Inserts: MSS Type 18.
   2. Center Beam Clamps: MSS Type 21.
   3. Steel Beam Clamps W/Eye Nut: MS Type 28.
   4. Linked Steel Clamps W/Eye Nut: MSS Type 29.
   5. Malleable Beam Clamps: MSS Type 30.
   6. Steel Brackets: One of the following for indicated loading:
   7. Light Duty: MSS Type 31.

2.05 SADDLES AND SHIELDS

A. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

B. Protection Shields: MSS Type 40; provide high density insert of same thickness of insulation.

2.06 MANUFACTURERS OF HANGERS AND SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide hangers and supports of one of the following:
   1. B-Line Systems, Inc.
   2. Tolco, Inc.
   3. Elcen Metal Products Co.
   4. Fee & Mason Mfg. Co.; Div. Figgie International.

5. ITT Grinnel Corp.

2.07 MISCELLANEOUS MATERIALS

A. Steel Plates, Shapes and Bars: ASTM A36.

B. Cement Grout: Portland cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 parts cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

C. Pipe Alignment Guides: Factory fabricated, of cast semisteel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe. Length of guides shall be as recommended by manufacturer to allow indicated travel.

D. Pipe Roll Stand: Factory fabricated cast iron stand, size as required, with insulation installed on piping.

2.08 ISOLATORS

A. Isolators: Provide factory-fabricated isolators of size required.

B. Spring Isolators: Refer to Section 23 05 48 "Vibration Control for HVAC."

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine substrates and conditions under which supports, and anchors are to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachment.

B. Prior to installation of hangers, supports, anchors and associated work, installer shall meet at project site with Contractor, installer of each component of associated work, inspection, and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.03 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top of inserts.

3.04 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69.

B. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers, and supports of same type and type as installed for adjacent similar piping.

D. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

E. Provisions of Movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors.

F. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

G. Pipe Slopes: Install hangers and supports to provide required pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

H. Bare Piping: Install isolators for all bare domestic water and bare hydronic piping.

I. Insulated Piping: Comply with the following installation requirements.
   1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
   2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields. Provide rigid insulation reinforcement at shields.

J. Hangers and supports to be capable to resist the minimum seismic forces indicated in drawings.

3.05 EQUIPMENT SUPPORTS

A. Concrete housekeeping bases will be provided as work of Division 03.

B. Furnish to Contractor, scaled layouts of all required bases, with dimensions of bases, and location to column center lines. Furnish templates, anchor bolts, and accessories, necessary for base construction.

3.06 ADJUSTING AND CLEANING

A. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.

B. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

D. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

E. For galvanized surfaces clean welds bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 05 48
VIBRATION CONTROL FOR HVAC

PART 1 - GENERAL

1.01 DESIGN REQUIREMENTS

A. It is the intent of this Specification to provide the necessary design for the avoidance of excessive noise or vibration in the building due to the operation of machinery or equipment, or due to interconnected piping, ductwork, or conduit and to seismically restraint piping, ductwork, and equipment per the applicable codes against seismic forces in any direction.
   1. All isolators shall:
      a. Be provided by a single manufacturer.
      b. Be designed or treated for resistance to corrosion. Structural steel bases shall be cleaned of welding slag and coated with an SCAQMD compliant primer.
      c. Be selected to perform their function without undue stress or overloading. All isolators shall have a method for leveling and have a 1/4" thick ribbed neoprene acoustical pad under the spring baseplate.
      d. Be installed in a manner to prevent the transmission of vibration to the structure. No rigid connections between rotating or oscillating equipment or piping and the building will be permitted.
      e. Be designed to be non-resonant with equipment forcing frequencies or support structure natural frequencies.
   2. Anchor floor mounted isolated equipment to concrete housekeeping pads of sufficient size to accommodate the anchorage of seismic restraints. Housekeeping pads shall be anchored to the structure as specified by the Structural Engineer of Record.
   3. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge ducts.
   4. Where called for in the specifications or on the drawings, all structural steel bases, including concrete pouring form bases, shall be designed, and fabricated by the isolation manufacturer. Isolation manufacturer shall be a licensed fabricator for the City of Los Angeles, California.
   5. Unless otherwise indicated, all equipment mounted on vibration bases shall have a minimum operating clearance of 1" between structural steel base and floor or support base beneath. The minimum operating clearance between concrete inertia bases and housekeeping pads shall be 1 inch. Check clearance space after installation to ensure that no debris has been left to possibly short circuit isolation bases.
   6. Where necessary due to height limitations, provide height saving brackets.
   7. Design isolators for positive anchorage against uplift and overturning.

1.02 MANUFACTURERS

A. Acceptable Isolation Manufacturer:

B. M. W. Sausse' & Co., Inc. (Vibrex).

C. Mason Industries, Inc.

D. Or Approved Equal.

E. Purchased and/or fabricated equipment must be designed and manufactured with provision for positive anchorage against seismic forces.

F. Seismic restraints for pipes and ducts shall be as per the SMACNA Guidelines for seismic Restraint of Mechanical Systems and shall be approved by DSA.

G. Seismic restraints for equipment and piping shall be designed to meet the criteria of the current California Code of Regulations.

H. The manufacturer of Vibration Isolation and Seismic Control Equipment shall have the following responsibilities:
   1. Determine adequate vibration isolation and seismic restraint sizes and locations.

2. Provide piping and equipment isolation systems and seismic restraints as scheduled and/or specified.
3. Provide installation instructions and drawings to assure proper installation and performance.

1.03 SUBMITTALS

A. Make Submittals in Accordance with:
   1. Contract General Provisions - Division 01.
   2. Mechanical General Provisions - Sections 23 05 00 and 23 05 11.

B. Submit Shop Drawings and Manufacturer's Literature.
   1. Specific vibration isolators and seismic restraints to be utilized showing compliance with the specifications.
   2. Isolation frame construction for each machine including dimensions, structural member sizes, support points and restraint locations and details.
   3. Methods for isolation and restraint of suspended piping, ductwork, and equipment.
   4. Methods for guides and isolation of piping risers.
   5. Seismic restraint calculations signed and stamped by an engineer licensed in the State of California and experienced in the design of isolation and seismic restraint for flexibly mounted equipment.

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATOR TYPES

A. "RMS" shall be a laterally stable un-housed spring isolator. Spring, top plate, and baseplate assembly shall be welded. Mounting shall comply with all requirements stated in paragraph above.

B. "RMSG" shall be the same as "RMS" above but shall include height saving brackets for attachment to the equipment frame or isolation base.

C. "RMSP-EQ" shall be the same as "RMS" above except that the spring shall be enclosed in a welded steel cylinder with uplift restraints for horizontal and vertical seismic control.

D. "RMLS-EQ" shall be the same as "RMS" above and shall be equipped with a steel housing designed for seismic restraint and with vertical limit stops to prevent the equipment changing from its loaded height should it be necessary to remove a portion of its weight. This housing may also be used as rigid blocking during rigging so that the installed height and the operating height of the isolated equipment remain the same. O.S.H.P.D. pre-approval # OPA-0029.

E. "RMLS-SB" shall be a steel frame constructed of structural wide flange members unless shown otherwise and shall be rectangular in shape. The depths of the steel members shall not be less than one tenth (1/10) of the longest span between base supports or designed for a maximum beam deflection of .005". If the latter method is used, submittals shall include calculations showing the necessary moment of inertia. All steel members shall be coped and fitted or constructed using the overlap insert method to assure a structural strength that is greater than the individual member strength. The steel frame is placed directly on top of the RMLS-EQ type isolators. O.S.H.P.D. Pre-approved isolator/seismic restraints.

F. "RMU-EQ-SH": shall be an individual semi-housed steel spring isolator complete with vertical motion limit stops incorporating seismic restraints, leveling, and ribbed neoprene pad bonded to the base plate. O.S.H.P.D. pre-approval # OPA-0098.

G. "AS" shall be air spring isolators and shall incorporate the following:
   1. A complete vibration isolation system consisting of a minimum of three air springs and a total of three height sensing valves. If there are two or more air springs per location, they shall be connected to the outlet of the height control valve in parallel. An associated interconnecting air supply system is required which is not included in this work.

2. The air spring shall operate at its normal operating height and the maximum pressure shall not exceed the manufacturer's recommended rating of 100 PSI. The system shall maintain an elevation of +/- 1/8", once adjusted.
3. The type of air spring to be utilized shall be based upon the required natural frequency as indicated in the schedule. In-order to avoid instability, auxiliary height saving brackets, housings, etc. may be utilized, subject to approval.

H. "RP-EQ" shall be a rubber pad type elastomer mounting, consisting of a steel bearing plate with 1/4" thick neoprene ribbed acoustical pad. Maximum loading shall be 60 PSI. Proper anchorage for seismic loads shall be indicated on drawings.

I. FUD-EQ shall be rubber-in-shear isolators incorporating mounting bolts for bolting to equipment base, a bottom steel plate for bolting isolator to sub-base or structure and built-in seismic restraints.

J. "RMXA" shall be a rectangular steel housing that shall be bolted to the overhead structure and designed to allow up to 30 degrees rod misalignment. Hanger shall consist of a steel spring located in a molded neoprene retaining cup with hanger rod bushing.

K. "PRMXA" - Same as type "RMXA" with the addition of a steel load transfer plate so that the equipment or piping operating height is the same as the installed height.

L. "HXA" -Same as type "RMXA" with the addition of a neoprene element in series to isolate the upper connection.

M. "PHXA" - Same as type "HXA" with the addition of a steel load transfer plate so that the equipment or piping operating height is the same as the installed height.

N. "HSS" - shall be a 'rubber in shear' isolator element contained within a rectangular steel housing.

2.02 RAIL AND BASE TYPES

A. "RMR" spring rail isolator. Rails shall have springs of proper size and constant, installed between a continuous structural steel channel (upper member) and a continuous flat steel plate (bottom member) in such manner, quantity, and location that efficient uniform deflection and loading to the structure is assured. Rails shall be furnished with Vibrex hold down stabilizers to restrict excessive amplitudes. Cross bracing must be used when necessary for seismic stability.

B. "RMB" shall be the same as "RMR" above except that it shall be designed as an integral fan and motor base with an adjustable motor slide base.

C. "RMSR" shall be a set of wide flange structural steel rails supplied with height saving brackets to reduce the mounting height of the equipment. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.005". A wide flange section depth greater than 1/10 the supporting span between isolators will be accepted as satisfying the deflection requirement.

D. "RMSB" shall be a steel frame constructed of structural wide flange members unless shown otherwise and shall be rectangular in shape. The depths of the steel members shall not be less than one tenth (1/10) of the longest span between base supports or designed for a maximum beam deflection of .005". If the latter method is used, submittals shall include calculations showing the necessary moment of inertia.

E. All steel members shall be coped and fitted or constructed using the overlap insert method to assure a structural strength that is greater than the individual member strength. Adjustable motor slide bases shall be included when required for centrifugal fan applications. The steel bases shall have an operating clearance of one (1") inch above the supporting structure. Where bases are used to mount pumps, the bases shall be large enough to support the pipe elbows if required.

F. "RMSBI" shall be a steel frame inertia base with all welded members and constructed of structural channel shapes. The base shall be designed for a thickness or inertia mass to equipment weight ratio as shown on the schedule with a minimum thickness of six (6") inches. The bases shall include a template and anchor bolts to anchor the equipment. Inertia bases shall have 1/2" (#4) rebar spaced a maximum of 12" on centers in each direction and located 1-1/2" from the bottom of the base. Adjustable motor slide bases shall be included when required for centrifugal fan applications. Bases shall be supplied with height saving brackets to reduce the mounting height of the equipment.

G. “RMUAB-EQ” shall be a steel frame made of structural angle with type “RMU-EQ-SH” O.S.H.P.D. pre-approved combination isolator/restraints.

H. "RMLSR" shall be a set of multiple wide flange structural steel rails supplied with type RMLS-EQ vibration isolator/seismic restraints and height saving brackets to reduce the mounting height of the equipment. The maximum allowable deflection of any point on the loaded frame relative to the unloaded frame shall be 0.005". A wide flange section depth greater than 1/10 the supporting span between isolators will be accepted as satisfying the deflection requirement.

I. Type "RMLSB" shall be a steel frame constructed of structural wide flange members unless shown otherwise and shall be rectangular in shape. The depths of the steel members shall not be less than one tenth (1/10) of the longest span between base supports or designed for a maximum beam deflection of .005". If the latter method is used, submittals shall include calculations showing the necessary moment of inertia. All steel members shall be coped and fitted or constructed using the overlap insert method to assure a structural strength that is greater than the individual member strength. Frame shall be supplied complete with height saving brackets and type RMLS-EQ, O.S.H.P.D. pre-approved isolator/seismic restraints.
   1. Type RMLS-SB is the same as type “RMLSB” but rather than utilizing height saving brackets the steel frame is placed directly on top of the RMLS-EQ type isolators.

2.03 CURB TYPES

A. Type "VIC-EQ-SS" shall be a factory fabricated combination roof mounting curb and vibration isolation base for rooftop package units over 25 tons. The curb assembly shall be designed so that it can be re-roofed without disturbing the HVAC equipment. Curbs must be designed so that roofing material cannot cover access to isolators. The vibration isolation portion of the assembly shall be constructed of structural steel and designed to mate with the bottom of the rooftop unit. System shall include factory fabricated duct supports and any required bracing welded in place. The sheet metal weather proofing curb portion shall be supplied complete with a wood-nailer strip to facilitate flashing by the roofing contractor. Internal vibration isolator/seismic restraints shall be OSHPD pre-approved number OPA-0029 as manufactured by MW Sausse’ & company, inc. Required anchorage calculations shall be supplied with submittal package. When required, curb shall include an optional acoustical package for sound reduction.

B. Type "VIC-EQ" shall be a factory fabricated combination roof mounting curb and vibration isolation base for rooftop package units up to 20 tons. Steel members and cross bracing shall all be welded. The assembly shall be shipped and installed in one piece complete with curb, weather-seal, removable OSHPD pre-approved isolator/restraints #OPA-0098, exterior accessible leveling device, and minimum 14 gage galvanized steel top section to match the unit. Curb shall be fabricated of minimum 12 gage galvanized steel designed to carry the seismic loads to the supporting structure. System shall include factory fabricated duct supports welded in place as well as insulated panels when required. Required anchorage and lower curb structural calculations shall be supplied with submittal package. When required, curb shall include an optional acoustical package for sound reduction. Curb shall be manufactured to match roof slope if specified in drawings.

2.04 SEISMIC RESTRAINTS

A. Shall be capable of safely accepting external forces as specified in the applicable codes without failure. Restraints shall maintain equipment, duct, and piping in a captive position during an earthquake. Restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise under normal operating conditions. Seismic restraints shall be provided on all equipment as scheduled on the drawings. Submit calculations by a Licensed Structural Engineer Registered in State of California to verify snubber capacities.

B. Type "3500" seismic restraint shall be constructed of steel plate, concentric steel pipes, and structural members in an all-welded assembly. All contact points shall be cushioned with minimum 1/4" thick resilient pad. Restraints shall be O.S.H.P.D pre-approved type OPA-0029.

C. Type "3200" seismic restraint shall be all directional type with interlocking steel members constructed of structural angle and A-36 threaded rod. All contact points shall be cushioned with minimum 1/4" thick resilient pad or bushing.

D. Type "CR" seismic restraints shall be constructed of 7x19 strand galvanized aircraft cable. Cable assembly shall come complete with minimum (2) "U" bolt clamps per end and thimbles to protect cable from chafing. Allowed loads shall be the cable breaking strength with a safety factor of three. Actual loads shall be calculated with the worst case of all loads applied to one cable and anchor pattern. Cable shall be installed with 1/4" slack to prevent the transmission of vibration to the structure.

PART 3 - EXECUTION

3.01 GENERAL

A. Install in accordance with manufacturer's written instructions. Vibration isolators must not be installed in a manner that will result in piping stress or misalignment.

B. The structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment or isolators. The isolators shall be installed without raising the equipment and frame assembly.

C. After the entire installation is complete and under full operational load, the isolator shall be adjusted so that the load is transferred from the blocks or shims to the isolator. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.

D. Once the equipment is in operation, install and anchor the seismic restraints with proper operating clearances as indicated on drawings.

E. HVAC equipment shall be isolated from the building structure by vibration isolators as scheduled on the drawings.

F. All piping 1 1/4" and over located in mechanical equipment rooms, and for a minimum of fifty (50) feet or 100 pipe diameters whichever is greater, from connection to vibrating mechanical or electrical equipment, shall be isolated from the building structure by means of vibration isolators as identified above.

G. All HVAC piping and vertical risers shall be isolated from the building structure by means of vibration isolators and guides.

H. All piping and ductwork to be isolated shall freely pass-through walls and floors without contact. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork and maintain adequate clearance (Minimum of 2 inches all around) around the outside surfaces. Any materials used to fill the clearance space shall be permanently flexible so that vibration will not pass through it.

I. No rigid connections between equipment and building structure, including electrical conduit and refrigerant lines, shall be made that degrades the vibration isolation system herein specified. Inform other following trades, such as plastering, or electrical, to avoid any contact which would short-circuit the vibration isolation.

J. Bring to the Architect's attention prior to installation any conflicts with other trades which will result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the contractor's expense.

K. Bring to the Architect's attention any discrepancies between the specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the contractor's expense.

L. Obtain inspection and approval of any isolation installation to be covered or enclosed, prior to such closure.

M. Thrust restraints shall consist of spring hangers with the same deflection as specified for the spring mountings. Thrust restraints shall be attached to the fan at the centerline of air discharge opening.

N. Correct, at no additional cost, all installations that are deemed defective in workmanship or materials.

3.02 PIPING ISOLATORS

A. All piping except fire standpipe systems, are included under this section.

B. Isolate piping within 50 feet of rotating equipment and pressure reducing stations.

C. The isolators shall be installed with the isolator hanger box attached to, or hung as close as possible to, approved locations on the supporting structure.

D. The isolators shall be suspended from substantial structural members, not from slab diaphragm unless specifically permitted.

E. Hanger rods shall be aligned to clear the hanger box.

F. Horizontal floor supported piping shall be isolated by type "RMLS-EQ", with a minimum static deflection of 1.0 inch or the same deflection as isolated equipment to which pipe is connected, whichever is greater.

G. Vertical riser pipe support and restraint system shall consist of type "RMS" springs and type "PG-EQ" guides. Install vertical riser guides so that clearances are maintained around concentric pipes in the guides. Install vertical restraints on the floor location as shown on drawings.

H. Pipe anchors, where required, shall utilize resilient pipe anchors, type "RPA" or equivalent, to avoid direct contact of piping with building.

I. Pipe Extension and Alignment connectors: Provide connectors at pump suction and discharge, riser take offs, cooling, and heating coils, and elsewhere as required to accommodate thermal expansion and misalignment.

J. Seismic restraint spacing shall be in accordance with applicable codes.

3.03 INSPECTION

A. On completion of installation of all vibration isolation and seismic control devices herein specified, the local representative of the isolation materials manufacturer shall inspect the completed system and report in writing any installation error, improperly selected isolation devices, or other faults in the system that could affect the performance of the system. The contractor shall submit a report to the Architect, including the above report with consequent steps taken to properly complete the isolation work.

END OF SECTION

SECTION 23 05 53
HVAC IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of HVAC identification work required by this section is indicated on drawings or specified in other Division 23 sections, and includes the following:
   1. Painted Identification Materials.
   2. Plastic Pipe Markers.
   3. Plastic Tape.
   4. Underground-Type Plastic Line Marker.
   5. Plastic Duct Markers.
   6. Valve Tags.
   7. Diagram and Schedule Frames.
   8. Engraved Plastic-Laminate Signs.
   9. Plastic Equipment Markers.
   10. Plasticized Tags.

1.02 RELATED SECTIONS

A. This section is part of each Division 23 section making reference to identification devices specified herein.

B. HVAC identification furnished as part of factory-fabricated equipment is specified as part of equipment assembly in other Division 23 sections.

C. Refer to Division 26 Sections for identification requirements of electrical work; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each identification material and device required.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

C. Schedules and Diagrams:
   1. Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any).
   2. Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule.
   3. Submit temperature control diagrams and Sequence of Operation on bond paper suitable for framing.

D. Maintenance Data: Include product data and schedules in maintenance manuals; in accordance with requirements of Division 01 and Division 23 Section 23 05 11 "Supplementary HVAC Requirements."

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
   2. No adhesive type identification markers will be accepted. All markers and tags shall be permanently attached to pipe, etc.
   3. All identification markers installed exterior of buildings shall be ultra-violet resistant.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide HVAC identification materials of one of the following:
   1. Seton Name Plate Corp.
   2. Allen Systems, Inc.
   3. Brady (W.H.) Co.; Signmark Div.
   4. Industrial Safety Supply Co., Inc.

2.02 HVAC IDENTIFICATION MATERIALS

A. General: Provide manufacturer's standard products of categories and types required for each application as referenced in other Division 23 sections. Where more than single type is specified for application, selections is Installer's option, but provide single selection for each product category.

2.03 PLASTIC PIPE MARKERS

A. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1.

B. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subject to fluid temperatures of 125oF. (52oC) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.

C. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
   1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
   2. Laminated or bonded application of pipe marker to pipe (or insulation).
   3. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".

D. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:
   1. Laminated or bonded application of pipe marker to pipe (or insulation).
   2. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1-1/2" wide; full circle at both ends of pipe marker, taped lapped 3".
   3. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless-steel bands.

E. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with names as shown or specified.
   1. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

2.04 PLASTIC TAPE

A. General: Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

B. Width: Provide 1-1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2-1/2" wide tape for larger pipes.

C. Color: Comply with ANSI A13.1, except where another color selection is indicated.

2.05 UNDERGROUND TYPE PLASTIC LINE MARKER

A. General: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates the type of service of buried pipe.
   1. Provide multi-ply tape consisting of solid aluminum foil core between 2-layers of plastic tape.

2.06 VALVE TAGS

A. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamped-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
   1. Provide 1-1/2" diameter tags, except as otherwise indicated.
   2. Fill tag engraving with black enamel.

B. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves and manufactured specifically for that purpose.

C. Access panel markers: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves and manufactured specifically for that purpose.

D. Access Panel Markers: Provide manufacturer's standard 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.07 DIAGRAM AND SCHEDULE FRAMES

A. General: For each page of schedule and/or diagrams, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.08 ENGRAVED PLASTIC LAMINATE SIGNS

A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, white with black core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.

C. Fasteners: Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.09 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in HVAC identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering and wording as indicated, as recommended by the manufacturers or as required for proper identification and operation/maintenance of HVAC systems and equipment.
   1. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, Air Supply No. 1H, Standpipe F12).

2.10 EQUIPMENT MARKERS

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
   1. Data:
      a. Manufacturer, product name, model number, and serial number.
      b. Capacity, operating and power characteristics, and essential data.
      c. Labels of tested compliances.
   2. Location: Accessible and visible.
   3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
   1. Terminology: Match schedules as closely as possible.
   2. Data.
   3. Name and plan number.
      a. Equipment service.
      b. Design capacity.
      c. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
   4. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine sub-core, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
   1. Data: Instructions for operation of equipment and for safety procedures.
   2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
   3. Retain and edit subparagraph above or first subparagraph below.
   4. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
   5. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
   1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.11 PLASTIC DUCT MARKERS

A. Engraved color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finishes, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.02 PIPING SYSTEM IDENTIFICATION

A. General: Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:
   1. Plastic pipe markers, with application system as indicated under "Materials" in this section. Install on pipe insulation segment where required for hot-non-insulated pipes.

B. Locate pipe markers as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
   1. Near each valve and control device.
   2. Near each branch, mark each pipe at branch, where there could be question of flow pattern.
   3. Near locations where pipes pass through walls, floors ceilings, or enter non-accessible enclosures.
   4. At access doors, manholes similar access points which permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.

6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment. On piping above removable acoustical ceilings, except omit intermediately.

3.03 UNDERGROUND PIPING IDENTIFICATION

A. General: During back-filling/top soiling of each exterior underground piping systems, except sanitary sewer and storm drainage install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker.

3.04 VALVE IDENTIFICATION

A. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units. List each tagged valve on valve schedule for each piping system.

B. Mount valve schedule frames and schedules in machine rooms, where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

3.05 HVAC EQUIPMENT IDENTIFICATION

A. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of HVAC equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:
   1. Fuel-burning units including boilers, furnaces, heaters.
   2. Pumps, compressors, chillers, condensers. and similar motor-driven units.
   3. Fans and blowers.
   4. Packaged HVAC central-station or zone-type units.
   5. Split air conditioner indoor and outdoor units
   6. Single Duct terminal units and all equipment in ceiling space.
   7. In addition to the equipment tag, install an identification tag for VAV units in locations approved by Architect to indicate where each unit is installed above the ceiling. Coordinate the installation location, type, size, and color of this tag with the Architect.

B. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2'-0", 1/2" high for distances up to 6'-0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

C. Test of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.06 ADJUSTING AND CLEANING

A. Adjusting: Relocate any HVAC identification device which has become visually blocked by work of this division or other divisions.

B. Cleaning: Clean face of identification devices, and glass frames of valve charts.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives and measurement and reporting of sound and vibration levels. including the following:
   1. Balancing airflow and water flow within distribution systems, including sub-mains, branches, and terminals, to indicated quantities according to specified tolerances.
   2. Test, adjust and balance hydronic system based on the requirements of the existing variable flow chilled and heating water systems.
   3. Adjusting total HVAC systems to provide indicated quantities.
   4. Measuring electrical performance of HVAC equipment.
   5. Setting quantitative performance of HVAC equipment.
   6. Verifying that automatic control devices are functioning properly.
   7. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:
   1. Testing and adjusting requirements unique to particular-systems and equipment are included in the Sections that specify those systems and equipment.
   2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.03 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including sub-mains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. T&B: Testing, adjusting, and balancing.

O. T&B Agency: An independent entity certified by AABC to perform testing and balancing work.

P. TBE: AABC certified test and balance engineer.

Q. TBT: AABC certified test and balance technician.

R. HVAC: Heating, ventilating, and air conditioning.

S. BAS: Building automation systems.

T. Contract documents: the mechanical drawings and test and balance specification.

U. NC: noise criteria.

V. RC: room criteria.

W. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation T&B of AABC certification of T&B agency and personnel, including a sample copy of the AABC "National Performance Guaranty." If not submitted within the timeframe specified, the engineer has the right to choose an AABC agency at the Contractor’s expense.

B. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures as specified in "Preparation" Article. Include a complete set of report forms intended for use on this Project.

C. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article to be used and filled out by systems Installers verifying that systems are ready for T&B.

D. Examination Report: Within 60 days of Contractor's Notice to Proceed, provide a summary report of the examination review required in Part 3 “Examination”, if issues are discovered that may preclude the proper testing and balancing of the systems.

E. Certified T&B reports: Within 14 days of completion of balancing work, submit AABC-Certified T&B report.
   1. Submit one copy of the final T&B Report directly to the design professional of record. Provide five additional copies to the contractor.

F. Warranty: Submit 6 copies of special warranty specified in the "Warranty" Article below.

G. Provide a summary of any discrepancies found in the system, by Air balance contractor to each system as described hereafter. Include a complete list of deficiencies and problems found in system being tested and balanced. Add this report to final submittal package.

1.05 QUALITY ASSURANCE

A. T&B Agency Qualifications: Engage a T&B entity certified by AABC.
   1. T&B Field Supervisor: Employee of the T&B Agency who is certified by AABC.
   2. T&B Technician: Employee of the T&B Agency and who is certified by AABC as a TBT.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.
   1. Agenda Items: Include at least the following:
      a. Submittal distribution requirements.
      b. Contract Documents examination report.
      c. Testing, adjusting, and balancing plan.
      d. Work schedule and Project site access requirements.

e. Systems readiness checklists.
f. Coordination and cooperation of trades and subcontractors.
g. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the 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 the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC "National Standards for Testing, Adjusting, and Balancing."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire T&B period. Cooperate with Owner during T&B operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during T&B operations to minimize conflicts with Owner's operations.

1.07 COORDINATION

A. Coordinate the 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. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

D. Review Division 23 contract documents to assure that the design has considered all required components necessary for a complete and successful testing, adjusting, and balancing of the system as described hereafter. Prepare a report for this examination of contract documents and propose any additional components required to complete the scope of work this section no later than 45 days after the award of the contract.

1.08 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. National Project Performance Guarantee: Provide a guarantee on AABC "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:
1. The certified Agent has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine 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.
   1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers.
   1. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation. Note the locations of devices that are not accessible for testing and balancing.

C. Examine approved submittal data of HVAC systems and equipment.

D. Examine project record documents described in Division 01 Section "Project Record Documents.

E. Examine ceiling plenums and under-floor air plenums used for supply, return, or relief air to verify that are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine HVAC equipment and verify that bearings are greased, belts are aligned, and tight, clean permanent filters are installed, and equipment with functioning controls is ready for operation.

G. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

H. Examine equipment performance data, including fan and pump 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.

I. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the 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 "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

J. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

K. Examine system and equipment test reports.

L. Examine HVAC system and equipment installations to verify that indicated 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.

M. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

N. Examine Air Conditioning equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

O. Examine terminal units, such as variable-air-volume boxes, VVT dampers and By-Pass Dampers are accessible and their controls are connected, configured by the Controls Contractor, and functioning.

P. Examine strainers to verify that mechanical contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.

Q. Examine Air Conditioning heat-transfer coils for clean and straight fins.

R. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.

S. Examine equipment for installation and for properly operating safety interlocks and controls.

T. Prior to examination of the vibration isolation system, verify that all system and equipment installations are complete and that testing, adjusting, and balancing specified in the contract documents have been performed.

U. Examine all vibration Isolation system. All vibration isolated equipment and piping must be inspected and examined before startup and shall include the following:
   1. Verify that all isolators are installed in accordance with manufacturer’s recommendations.
   2. Verify that all isolation roof curbs have been adjusted by unit manufacturer. Provide a copy of the manufacturer’s certification for adjustment of the isolators of the roof curb.
   3. Verify that piping, duct, and conduit penetrations through mechanical equipment room envelope are sealed, and if required, rigid contact with building structure does not exist.
   4. Steel isolation bases must be inspected for cracked welds, excessive bending or twisting of steel members.
   5. Concrete isolation bases must be examined for cracked concrete. Isolator retainer brackets must be checked for looseness. The concrete base must be flat and true in plane.
   6. Elastomer isolators must be examined for cracks in the rubber and for loose bonds between the rubber and steel plates or other steel components. Adequate clearance must be provided between bolts and the side of the bolt holes to prevent short circuiting.
   7. Steel spring isolators must be examined for loose or missing bolts, nuts or lock washers. Check for spring overloading or under-loading, completely collapsed spring coils, and cocked springs. Note if rubber or glass fiber pad between the bottom plate of the steel spring and the concrete slab or supporting structure is present.
   8. Housed steel springs must be examined for proper centering of the springs, clearance between the cast housing and rubber snubber, and the steel spring for tilted or cocked springs.
   9. When the specifications require that the isolators be bolted to the concrete slab or other supporting structure, the bolts may be isolated by means of rubber bushings and rubber washers.
   10. Inspect isolators with restraint devices to make sure that all shims have been removed and supportive nuts have been properly adjusted to allow for free floating of the isolated system.
   11. Seismic restraints shall not prevent the proper functioning of vibration isolation system.
   12. Pneumatic isolators must be inspected for overload or under-load by checking the air pressure gauge against manufacturer's submittals or catalog. The pneumatic isolator system should include the isolator, strainer, oil separator, height regulator, and air pressure gauge. Inspect the vicinity of the isolator. Note if the isolator is exposed to damage from vehicle or other traffic.
   13. Carefully inspect the space under all isolated bases to assure that these spaces are clean and free of debris to prevent short-circuiting.
   14. Check to ensure that all shipping bolts associated with spring isolators have been removed.
   15. Inspect all flexible piping, hoses, and expansion joints as to type, length and location as called for by the specifications. Examine flexible hose for excessive elongation.
   16. Inspect all electrical and control connections to ensure that they do not restrain the movement of the vibration isolated equipment.
   17. Inspect all fabric connections between fans and ductwork to ensure that a fabric "bellows" exists when the fans are operating.

18. Each piece of vibration isolated machinery must be free of any structural tie or rigid connection that may "short circuit" the isolation system. All limit stops, shipping bolts, and leveling bolts on all isolators must be inspected to ensure that they are not "short circuiting" the isolation system.
19. Hanger isolators should be free of misalignment and over / under-loading. Under no circumstances the isolator rod should be allowed to make rigid contact with the hanger housing.
20. Report deficiencies as discovered to the appropriate parties.

V. Examine automatic temperature system components to verify the following:
1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multi-zone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including 2-way valves, are properly connected.
5. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. 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.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to design values.

W. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures that includes the following:
1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Prepare system-readiness checklists, as described in the "AABC National Standards for Total System Balance," for use by systems installers in verifying system readiness for T&B. These shall include, at a minimum, the following:
1. Airside:
a. Ductwork is complete with terminals installed.
b. Volume, smoke, and fire dampers are open and functional.
c. Clean filters are installed.
d. Fans are operating, free of vibration, and rotating in correct direction.
e. Variable-frequency controllers' start-up are complete and safeties are verified.
f. Automatic temperature-control systems are operational.
g. Ceilings are installed.
h. Windows and doors are installed.
i. Suitable access to balancing devices and equipment is provided.
2. General
a. Permanent electrical power wiring is complete.
b. Equipment and duct access doors are securely closed.

3.03 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC "National Standards for Total System Balance" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for T&B procedures.

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP)units.

3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain approved submittals and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare single-line schematic diagram of systems "as-built" for the purpose of identifying HVAC components.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check condensate drains for proper connections and functioning.

H. Check for proper sealing of air-handling-unit components.

I. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

J. Check dampers for proper position to achieve desired airflow path.

K. Check for airflow blockages.

3.05 PROCEDURES FOR CONSTANT VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Measure total airflow.
      a. Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
      b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
      c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
      d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
   2. Measure fan static pressures as follows:
      a. Measure static pressure directly at the fan outlet or through the flexible connection.
      b. Measure static pressure directly at the fan inlet or through the flexible connection.
      c. Measure static pressure across each component that makes up the air-handling system.
      d. Report any artificial loading of filters at the time static pressures are measured.
   3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows.
   1. Measure airflow of sub-main and branch ducts.
   2. Adjust sub-main and branch duct volume dampers for specified airflow. Re-measure each sub-main and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.
   1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
   2. Measure airflow at all inlets and outlets.
   3. Adjust each inlet and outlet for specified airflow.
   4. Re-measure each inlet and outlet after all have been adjusted.

D. Verify final system conditions.
   1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
   2. Re-measure and confirm total airflow is within design.
   3. Re-measure all final fan operating data, RPM, Volts, Amps, static profile.
   4. Mark all final settings.
   5. Test system in economizer mode. Verify proper operation and adjust, if necessary.
   6. Measure and record all operating data.
   7. Record final fan performance data.

3.06 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature control system.

B. Measure indoor wet-bulb and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside air wet-bulb and dry-bulb temperatures.

3.07 PROCEDURES FOR VIBRATION MEASUREMENTS

A. Perform vibration measurements when other building and outdoor vibration sources are at a minimum level and will not influence measurements of equipment being tested.
   1. Turn off equipment in the building that might interfere with testing.
   2. Restrict people from occupying areas where human activity may affect accuracy of measurements.
   3. Note all exterior vibration sources i.e., trains, roadway traffic, adjacent construction activities, etc.

B. Attach and secure the vibration transducer in accordance with the latest edition of the AABC S&V Procedural Standards for Measurement of Sound and Vibration.

C. Measure and record, on all pumps and fans over 3 HP, and all chillers and compressors over 5 HP, at discrete frequencies or in 1/3 octave bands as follows:
   1. Discrete vibration levels from 1 to 200 Hz in 1 Hz increments, or
   2. In each 1/3 octave band from 12.5 Hz to 100 Hz.

D. Measure and record equipment vibration, bearing vibration, equipment base vibration, and on building structure adjacent to equipment. Record velocity and displacement readings in the radial vertical, radial horizontal and axial planes, where measurements can be performed safely.
   1. Fans and HVAC Equipment with Fans:
      a. Fan Bearing: Drive end and opposite end.
      b. Motor Bearing: Drive and opposite end.
      c. Equipment Base: Top and side, within 6” of each isolator.
      d. Building: Floor adjacent to fan/motor, within 6” of each isolator.
   2. Chillers and HVAC Equipment with Compressors:
      a. Compressor Bearing: Drive end and opposite end.
      b. Motor Bearing: Drive end and opposite end.
      c. Equipment Base: Top and side, within 6” of each isolator.
      d. Building: Floor adjacent to equipment, within 6” of each isolator.

E. Vibration Measurement Reports:
   1. Date and time of test.
   2. Equipment designation, location, equipment speed, motor speed and motor horsepower.
   3. Measured acceleration (in units of g's, inches/sec^2), and measured velocity (in units of inches/sec) and measured displacement (in units of inches).

3.08 PROCEDURES FOR SOUND LEVEL MEASUREMENTS

A. Close windows and doors to the space.

B. Perform measurements when the space is not occupied, or when the occupant noise levels from other spaces in the building and outside are at a minimum, or do not affect sound readings.

C. Clear the space of temporary sound sources so unrelated disturbances will not be measured. Turn off all sound sources (personal computers, printers, fax machines, etc) in the space that may affect sound readings.

D. Position testing personnel during measurements to achieve a direct line-of-sight between the sound source and the sound-level meter.

E. Take sound measurements at a height approximately 48 inches above the floor and at least 36inches from a wall, column, or any other large surface capable of altering the measurements.

F. Take sound measurements in dB (linear or flat), with the slow time constant, in the octave bands from 31.5 to 8000 Hz.

G. Take sound measurements with the HVAC systems off to establish the background levels and take sound measurements with the HVAC systems operating. Calculate the difference between measurements. Apply a correction factor depending on the difference and adjust measurements.

H. Perform sound testing in all occupied space horizontally and vertically adjacent to all mechanical equipment rooms and all mechanical chases.

I. Perform sound testing at 10% of locations on the project for each type of the following spaces. For each space type tested, select a measurement location that has the greatest anticipated sound level. If testing multiple locations for each space type, select at least one location that is near and at least one location that is remote from the predominant sound source.
   1. Private office.
   2. Open office area.
   3. Conference room.
   4. Auditorium/large meeting room/lecture hall.
   5. Classroom/training room.
   6. Library open space.
   7. Public areas (such as, lobbies, hallways, break rooms).
   8. Perform sound testing in all spaces with a design criterion of NC or RC 25 or less.

J. Sound Measurement Reports: Record sound measurements on appropriate test forms, indicating the decibel levels measured in for both "background" and "HVAC system operating" readings. Record each tested location on a separate NC or RC chart. Record the following on the forms.
   1. Date and time of test.
   2. Equipment operational parameters – speed / frequency at time of measurements.
   3. Indoor measurements - space location within building including floor level and room /space number.
   4. Outdoor measurements – location identifier such as location relative to equipment, building, or property line.
   5. Indicate where measurements meet or exceed design criteria.

3.09 CONTROL VERIFICATION

A. In conjunction with system balancing perform the following:
   1. Work with the temperature control contractor to ensure the system is operating within the design limitations and gain a mutual understanding of intended control performance.
   2. Confirm that the sequences of operation are in-compliance with the approved drawings. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.
   3. Verify that controllers are calibrated and function as intended.
   4. Verify that controller set points are as specified.
   5. Verify operation of limiting controllers (i.e., high, and low temperature controllers).
   6. Verify the operation of lockout or interlock systems.
   7. Verify the operation of all valve and damper actuators.
   8. Verify that all controlled devices are properly installed and connected to the correct controller.
   9. Verify that all controlled devices travel freely and are in the position indicated by the controller: open, closed, or modulating.
   10. Verify the location and installation of all sensors to ensure they will sense only the intended temperatures, humidity, or pressures. Note conditions that would adversely affect control functions.
   11. Record controller settings and note variances between set points and actual measurements.
   12. Confirm interaction of electrically operated switch transducers.
   13. Verify main control supply-air pressure and observe compressor and dryer operations.
   14. Record voltages of power supply and controller output. Determine if the system operates on a grounded or non-grounded power supply.
   15. Note operation of electric actuators using spring return for proper fail-safe operations.

B. Reporting
   1. The report shall include a summary of verifications performed, remaining deficiencies, and any variations from specified conditions.

3.10 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: Minus 10 to plus 10 percent.
   2. Fresh air intake: 0 to plus 5%.
   3. Air Outlets and Inlets: Minus 10 to plus 10 percent.
   4. Heating-Water Flow Rate: Minus 5 to plus 5 percent.
   5. Cooling-Water Flow Rate: Minus 5 to plus 5 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.11 REPORTING

A. Initial Construction Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: 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.

3.12 FINAL REPORT

A. General: Computer printout in letter-quality font, on standard bond paper, in a fine quality 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. The final report for sound and vibration measurement shall be in accordance with the requirements of the current edition of the AABC Procedural Standards for Measurement of Sound and Vibration.

C. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
   1. Include a list of the instruments used for procedures, along with proof of calibration.

D. Final Report Contents: In addition to the certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

E. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of testing, adjusting, and balancing Agent.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address and field technician responsible for the project.
   8. Report date.
   9. Signature of testing, adjusting, and balancing Agent who certifies the report.
   10. 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.
   11. Nomenclature sheets for each item of equipment.
   12. Data for terminal units, including manufacturer, type size, and fittings.
   13. Notes to explain why certain final data in the body of reports vary from design values.
   14. Test conditions for fans and pump performance forms, including the following:
      a. Settings for outside-air, return-air, and exhaust-air dampers.
      b. Conditions of filters.
      c. Cooling coil, wet-bulb, and dry-bulb conditions.
      d. Face and bypass damper settings at coils.
      e. Fan drive settings, including settings and percentage of maximum pitch diameter.
      f. Inlet vane settings for variable-air-volume systems.
      g. Settings for supply-air, static-pressure controller.
      h. Other system operating conditions that affect performance.

F. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
   1. Quantities of outside, supply, return, and exhaust airflows.
   2. Water and steam flow rates.
   3. Duct, outlet, and inlet sizes.
   4. Pipe and valve sizes and locations.
   5. Balancing stations.

G. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
   1. Unit Data: Include the following:
      a. Unit identification.
      b. Location.
      c. Make and type.
      d. Model number and unit size.
      e. Manufacturer's serial number.
      f. Unit arrangement and class.
      g. Discharge arrangement.
      h. Sheave make, size in inches, and bore.
      i. Sheave dimensions, center to-center and amount of adjustments in inches.
      j. Number of belts, make, and size.
      k. Number of filters, type, and size.
   2. Motor Data: Include the following:
      a. Make and frame type and size.
      b. Horsepower and RPM.
      c. Volts, Phase, and Hertz.
      d. Full-load amperage and service factor.
      e. Sheave make, size in inches, and bore.
      f. Sheave dimensions, center-to-center, and amount, of adjustments in inches.
   3. Test Data: Include design and actual values for the following:
      a. Total airflow rate in CFM.
      b. Total system static pressure in Inches W.G.
      c. Fan RPM.
      d. Discharge static pressure in Inches W.G.
      e. Filter static-pressure differential in Inches W.G.
      f. Preheat coil static-pressure differential in Inches W.G.
      g. Cooling coil static-pressure differential in Inches W.G.
      h. Heating coil static-pressure differential in Inches W.G.
      i. Outside airflow in CFM.
      j. Return airflow in CFM.
      k. Outside-air damper position.
      l. Return-air damper position.
      m. Vortex damper position.

H. Apparatus-Coil Test Reports: For apparatus coils, include the following:
   1. Coil Data: Include the following:
      a. System identification.
      b. Location.
      c. Coil type.
      d. Number of rows.
      e. Fin spacing in fins per inch.
      f. Make and model number.
      g. Face area in Sq. Ft.
      h. Tube size in NPS.
      i. Tube and fin materials.
      j. Circuiting arrangement.
   2. Test Data: Include design and actual values for the following:
      a. Airflow rate in CFM.
      b. Average face velocity in FPM.
      c. Air pressure drop in Inches W.G.
      d. Outside-air, wet- and dry-bulb temperatures in deg F.
      e. Return-air, wet- and dry-bulb temperatures in deg F.
      f. Entering-air, wet- and dry-bulb temperatures in deg F.

g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in GPM.
i. Water pressure differential in Feet of Head or PSIG.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in PSIG.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in PSIG.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data: Include the following:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center to-center and amount of adjustments in inches.
2. Motor Data: Include the following:
a. Make and frame type and size.
b. Horsepower and RPM.
c. Volts, Phase, and Hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center to-center and amount of adjustments in inches.
g. Number of belts, make, and size.
3. Test Data: Include design and actual values for the following:
a. Total airflow rate in CFM.
b. Total system static pressure in Inches W.G.
c. Fan RPM.
d. Discharge static pressure in Inches W.G.
e. Suction static pressure in Inches W.G.

J. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data: Include the following:
a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in Inches W.G.
e. Duct size in Inches.
f. Duct area in Sq. Ft.
g. Design airflow rate in CFM.
h. Design velocity in FPM.
i. Actual airflow rate in CFM.
j. Actual average velocity in FPM.
k. Barometric pressure in PSIG.

K. Air-Terminal-Device Reports: For terminal units, include the following:
1. Unit Data: Include the following:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.

e. Manufacturer's serial number.
f. Arrangement and class.

2. Test Data: Include design and actual values for the following:
a. Airflow rate in CFM.
b. Air velocity in FPM.
c. Preliminary airflow rate as needed in CFM.
d. Preliminary velocity as needed in FPM.
e. Final airflow rate in CFM.
f. Final velocity in FPM.
g. Space temperature in deg F.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data: Include the following:
a. System and air-handling unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flow-meter type.

2. Test Data: Include design and actual values for the following:
a. Airflow rate in CFM.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in Feet of Head or PSIG.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

M. Instrument Calibration Reports: For instrument calibration, include the following:
1. Report Data: Include the following:
a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.13 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.

C. Duct Leakage Testing:
1. Perform duct pressure/leakage testing on newly constructed ductwork.
2. Verify that proper test methods are used and that leakage rates are within specified tolerances per section 23 31 13.
3. Report any deficiencies observed.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of HVAC insulation required by this section is indicated on drawings and schedules, and by requirements of this section, and includes the following:
   1. Piping Systems Insulation:
      a. Fiberglass.
      b. Calcium Silicate.
      c. Flexible Unicellular.
   2. Ductwork System Insulation:
      a. Fiberglass.
      b. Flexible Unicellular.
   3. Equipment Insulation:
      a. Fiberglass.
      b. Calcium Silicate.
      c. Flexible Unicellular.
   4. Acoustical Insulation:
      a. Fiberglass.

1.02 RELATED SECTIONS

A. Refer to Division 23 Section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.

B. Refer to Division 23 Section "HVAC Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of HVAC insulation. Submit schedule showing manufacturer's product number, K-value, thickness, and furnished accessories for each HVAC system requiring insulation.

B. Maintenance Data: Submit maintenance data and replacement material lists for each type of HVAC insulation. Include this data and product data in maintenance manual.

1.04 QUALITY ASSURANCE

A. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

B. As a minimum, insulation shall meet installed conductance as set forth in Title 24 California Code of Regulations (CCR) 2016 Building Energy Efficiency Standards or as indicated in contract documents, whichever is greater.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   1. Owens-Corning Fiberglas Corp.
   2. Manville Products Corp.

3. CertainTeed Corp.
4. Armstrong World Industries, Inc.
5. Knauf Fiber Glass GmbH.

2.02 PIPING INSULATION MATERIALS

A. Fiberglass (Mineral Fiber) Piping Insulation: ASTM C547, Class 1 unless otherwise indicated. Manville Products Corp. Micro-Lok, Owens-Corning Fiberglas Corp., ASJ/SL-II or equivalent.

B. Calcium Silicate Piping Insulation: ASTM C533, Type I. Owens-Corning Fiberglass Corp. "Kaylo Asbestos Free" or equivalent.

C. Flexible Unicellular Piping Insulation: ASTM C534, Type I. Armstrong World Industries, Inc. meeting ASTM E-84 25/50 index.

D. Jackets for Piping Insulation: ASTM C921, Type I (Vapor Barrier) for piping with temperatures below ambient. (Type II (Water Vapor Permeable) for piping with temperatures above ambient. Type I may be used for all piping at Installer's option.
   1. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations. Zeston PVC Insulated fitting covers or equivalent.
   2. Encase exterior piping insulation with aluminum jacket with weather-proof construction.

E. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

F. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

G. All Insulation shall be U.L. listed showing flame spread not greater than 25, nor smoke greater than 50, per NFPA 90A.

2.03 DUCTWORK INSULATION MATERIALS

A. Flexible Fiberglass Ductwork Insulation: ASTM C553, Type I, Class B-2, Owens-Corning Fiberglas Inc. un-faced duct wrap insulation, Type 100 or equivalent.
   1. Nominal thickness or equivalent to provide installed R-value as follows:
      a. 1.5" thick - Installed R = 4.2
      b. 2.0" thick - Installed R = 5.6

B. Flexible Fiberglass Ductwork Insulation: ASTM C612, with ASTM C921 Type I vapor barrier jacket. Owens/Corning Fiberglas All Service Wrap Insulation, Type 100 or equivalent:
   1. Nominal thickness or equivalent to provide an installed R-value as follows:
      a. 1.5" thick - Installed R = 4.2
      b. 2.0" thick - Installed R = 5.6

C. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

D. Rooftop ductwork and ductwork that are not in conditioned space or indirectly conditioned spaces are to be insulated with material to achieve minimum installed R value equal to 8.0 to meet the 2019 Building Energy Efficiency Standards. For double wall rooftop ductwork see HVAC drawings.

E. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes, and similar compounds as recommended by insulation manufacturer for applications indicated.

F. All Insulation shall be U.L. listed showing flame spread not greater than 25, nor smoke greater than 50, per NFPA 90A.

2.04 EQUIPMENT INSULATION MATERIALS

A. Flexible Fiberglass Equipment Insulation: ASTM C553, Type II, Class F-1, Owens-Corning Fiberglass, Inc., Type 701 1.5 lbs/Ft3.

B. Calcium Silicate Equipment Insulation: ASTM C533, Type I, Block; Owens/Corning Fiberglass, Inc., Kaylo Asbestos Free, U-Grooved block insulation.

C. Jacketing Material for Equipment Insulation: Provide canvas jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.

D. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics, and protective finishes as recommended by insulation manufacturer for applications indicated.

E. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape corner angles, anchors and stud piping as recommended by insulation manufacturer for applications indicated.

F. All Insulation shall be U.L. listed showing flame spread not greater than 25, nor smoke greater than 50, per NFPA 90A.

2.05 ACOUSTICAL INSULATION

A. Rigid Fiberglass Insulation: ASTM C612, Class 1, Owens/Corning Fiberglass, Inc., 10 Lbs/Cu. Ft.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which HVAC insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 HVAC PIPING SYSTEM INSULATION

A. Insulation Omitted: Omit insulation on the following:
   1. Hot piping within radiation enclosures.
   2. Hot unions, flanges, strainers, flexible connections, and expansion joints.

B. Cold Piping (40ºF to ambient):
   1. Application Requirements: Insulate the following cold HVAC piping systems:
      a. HVAC chilled water supply and return piping.
      b. Air conditioner condensate drains piping.
   2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
      a. Fiberglass: 1" thick for pipe sizes up to and including 4", 1-1/2" thick for pipe sizes over 4".
      b. Flexible Unicellular: 1/2" thick for pipe sizes up to 1-1/2" (A.C. condensate piping only).

C. Hot Low-Pressure Piping (to 250ºF):
   1. Application Requirements: Insulate the following hot low pressure HVAC piping systems (steam piping up to 15 psi, water piping up to 250ºF (121ºC).
      a. HVAC heating water supply and return piping.
   2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
      a. Fiberglass: 1" thick for pipe sizes up to and including 1", 1-1/2" thick for pipe sizes 1-1/2"; 2" thick for piping over 2".

3.03 DUCTWORK SYSTEM INSULATION

A. Insulation Omitted:
   1. Do not insulate outside air ductwork unless otherwise indicated.
   2. Do not insulate exhaust air ductwork unless otherwise indicated.
   3. All ductwork specified to be insulated that is located in mechanical rooms, located on roofs or where exposed in conditioned spaces or to weather shall be internally lined under Section 23 31 13 "Metal Ductwork"; unless noted otherwise in these specifications or on the drawings.

B. Insulate the following with flexible fiberglass insulation, faced, 1.5" thickness unless otherwise noted. Firmly wrap insulation around duct work with all joints lapped a minimum of 2 inches. Secure insulation to ducts by means of 16 gauge soft-annealed galvanized wire spaced 12 inches on centers at loose ends.
   1. Warm air heating ductwork in concealed spaces, unless in ceiling plenum provide all service wrap insulation.
   2. Return air ductwork in non-conditioned concealed spaces unless in ceiling supply plenum uses all service wrap insulation.
   3. Return air ductwork located in return air ceiling plenums and outside air ductwork supplying fan coil units.

C. Insulate the following with Flexible Fiberglass insulation with all service vapor barrier facing, 1.5" thickness unless noted otherwise.
   1. HVAC hot/cold mixed air ductwork between fan discharge or HVAC unit discharge, and room terminal unit.
   2. Outdoor air intake ductwork between air entrance and indoor fan inlet or indoor HVAC unit inlet.
   3. Installation:
      a. Neatly wrap insulation around ducts with all joints tightly butted together.
      b. Seal transverse joints with vapor barrier facing tab overlapping all joints 2 inches and secure with vapor barrier adhesive or outward-clinch staples on 4-inch centers.
      c. Seal longitudinal joints with 4-inch wide, vapor barrier adhesive tape.
      d. Secure insulation to underside of ducts, 100 percent coverage, with ductwork insulation adhesive.
      e. In addition to adhesive, on underside of ducts 24-inches or greater in width use mechanical fasteners on maximum 12-inch centers.
      f. Seal all penetrations of vapor barrier facing with vapor barrier mastic.

D. Insulate the following with Rigid Fiberglass Insulation, 2.0" thickness unless noted otherwise.
   1. HVAC and unit housings not pre-insulated at the factory or where lining has been specifically omitted.
   2. Installation: Fasten to ductwork with adhesive and pins per manufacturer's recommendations. Provide all Butt-joints with a 16 gage corner angles at corners. Seal all joints with approved duct tape.

E. Contractor's Option: Contractor may provide duct liner as set forth in Section 23 31 13, using equivalent installed "R" values; in lieu of external duct-wrap or rigid insulation as specified above unless ductwork is specifically indicated as being unlined.

F. Hot Ductwork:
   1. Application Requirements: Insulate range and hood exhaust ductwork with PABCO "Super Fire Temp" asbestos free, non-combustible fireproofing board.
      a. Provide 1 to 4-hour fire rating as indicated.
      b. Install per manufacturer's instructions.

3.04 EQUIPMENT INSULATION

A. Cold Equipment (Below Ambient Temperature):
   1. Application requirements: Insulate the following cold equipment:
      a. Refrigeration equipment, including chillers, tanks, and pumps.
      b. Drip pans under chilled equipment.
      c. Cold and chilled water pumps.
      d. Pneumatic water tanks.
   2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
      a. Fiberglass: 2" thick for cold surfaces above 35ºF and 3" thick for surfaces 35ºF and lower.

B. Hot Equipment (Above Ambient Temperature):
   1. Application Requirements: Insulate the following hot equipment:
      a. Boilers (not pre-insulated at factory).
      b. Water heaters.
      c. Hot water expansion tanks.
      d. Hot water pumps.
   2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation.
      a. Fiberglass: 2" thick, except 3" thick for low-pressure boilers and steam-jacketed heat exchangers.

C. Breeching and Stacks:
   1. Application Requirements: Insulate the following breechings and stacks:
      a. Breechings between heating equipment outlet and stack or chimney connection, except for double wall or factory insulated breechings.

3.05 INSTALLATION OF PIPING INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems, subsequent-to installation of heat tracing, painting, testing, and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulated each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure a complete and tight fit over surfaces to be covered.

E. Maintain integrity of vapor barrier jackets on pipe insulation and protect to prevent puncture or other damage.

F. Cover valves, fittings, and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

G. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise indicated.

H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.06 INSTALLATION OF DUCTWORK INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor barrier on ductwork insulation and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors, and similar ductwork penetrations, except where otherwise indicated.

F. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.

G. Ductwork Exposed to Weather: Where external insulation has been specifically indicated, protect outdoor insulation from weather by installing outdoor protective finish or jacketing as recommended by manufacturer.

H. Corner Angles: Except for oven and hood exhaust duct insulation, install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

3.07 INSTALLATION OF EQUIPMENT INSULATION

A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship.

C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.

D. Do not apply insulation to equipment, breechings, or stacks while hot.

E. Apply insulation using the staggered joint method for both single, and double-layer construction, where feasible. Apply each layer of insulation separately.

F. Coat insulated surfaces with layer of insulating cement, trowel in workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

G. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.

H. Do not insulate boiler manholes, hand-holes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

I. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, and accessories.

J. Equipment exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by the manufacturer.

3.08 ACOUSTICAL INSTALLATION

A. Install within confines of roof curbs for roof mounted air handlers and air conditioning units, and elsewhere as indicated on drawings.

B. Cut to fit snugly within curb and around duct at duct penetrations, 4" minimum thickness.

3.09 PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

23 09 23

ENERGY MANAGEMENT SYSTEMS FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes equipment and performance criteria for furnishing all labor and materials for the installation and programming for Energy Management System for HVAC Systems utilizing wireless communication with cloud based servers.

1.02 RELATED SECTIONS

A. Division 01: General Requirements

B. Section 23: Heating, Ventilating, and Air-Conditioning (HVAC)

1.03 SUBMITTALS

A. Shop Drawings and product data in accordance with the specifications.

B. All shop drawings shall be prepared in AutoCAD 2000 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.

C. All submittals shall be bound or in a three ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect or engineer for distribution and review.

D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by others, required for proper installation of systems of this section.

E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.

F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.

G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

1.04 SCOPE OF WORK

A. Except as otherwise noted, the control system shall consist of all thermostats, and gateways to fill the intent of the specification and provide for a complete and operable system.

B. The EMS contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.

C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.

D. When the EMS system is fully installed and operational, the EMS Contractor will make himself available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the EMS contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.

E. The Contractor shall furnish and install a complete EMS control system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install EMS controls for the HVAC Equipment as noted on the drawings:

F. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and the owner's team.

G. Contractor shall provide one training session in the operation of the system, for owner's personnel.

H. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction.

1.05 SYSTEM DESCRIPTION

A. The Energy Management System (EMS) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web based management system using a cloud server program complying with the following specifications.

B. The entire Energy Management Solution (EMS) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner’s wide area network (WAN) over a TCP/IP connection. Access and control of EMS is through a web based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

1.06 WORK BY OTHERS

A. The EMS Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others’ work prior to fabrication and installation. The owner's representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. EMS Contractor shall provide field supervision to the Mechanical Contractor for pre-installation of control components.

B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by others. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacture's installation instructions) installed per owner's specifications. (Wiring in existing installations shall be minimum 3 conductor / 24 gauge wires per EMS manufacturer's standard specifications, multiple c conductor/24 gauge thermostat wiring preferred - see Installation Instructions for specific conductor counts depending on heating and cooling modes of existing equipment.)

C. Related work provided by others:
   1. 110 V outlets shall be provided within 5 feet of each gateway location.
   2. 1 Data port shall be provided within 10 feet of each gateway location.

D. Equipment start-up and servicing

1.07 CODE COMPLIANCE

A. Provide EMS components and ancillary equipment which are code compliant.

B. All wiring shall conform to the National Electrical Code.

C. All products of the EMS shall reside with the following agency approvals.
   1. California 2013 Title 24 Compliant.
   2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
   3. OpenADR2.0 certified.

1.08 SYSTEM STARTUP & COMMISSIONING

A. Each EMS component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the EMS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

B. The EMS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The EMS Contractor shall have a trained technician available on request during the balancing of the systems. The EMS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to EMS.

1.09 TRAINING

A. The EMS Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The EMS Contractor shall provide on-site training to the District’s representative(s) and maintenance personnel per the following description:

B. On-site training shall consist of a minimum of (1) hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include
   1. System Overview
   2. System Software and Operation
   3. System access
   4. Software features overview
   5. Changing set points and other attributes
   6. Scheduling
   7. Editing programmed variables
   8. Displaying color graphics
   9. Running reports
   10. Workstation maintenance
   11. Application programming
   12. Operational sequences including start-up, shutdown, adjusting and balancing.
   13. Equipment maintenance

1.10 OPERATING AND MAINTENANCE MANUALS

A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire EMS. This documentation shall include specific part numbers.

B. Following project completion and testing, the EMS contractor will submit as-built documentation reflecting the exact installation of the system.

1.11 WARRANTY

A. The EMS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the EMS contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. EMS equipment shall be warranted for a period of 5 years from the time of system acceptance.

B. Warranty of equipment is limited to replacement of defective products.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems,

B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Project Manager at least 10 days prior to bid due date.

2.02 WIRELESS GATEWAY (WG)

A. A single WG shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Internet Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements

B. The WG must provide the following hardware features as a minimum:
   1. Single Ethernet Port.
   2. One micro-USB 5VDC power input.
   3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.

C. The WG shall provide the communication link between the entire system and a cloud based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).

D. The WG shall be able to support 2000 Internet Programmable Thermostats.

2.03 INTERNET PROGRAMMABLE THERMOSTAT (IPT)

A. Internet Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.

B. The IPT shall provide a keypad for setting:
   1. Temperature Set points.
   2. System Mode (Heat, Cool, Auto, Off).
   3. Fan Mode (Auto, On).
   4. Light Button.

C. The IPT shall include a wiring terminal for controlling a single zone HVAC unit. The wiring terminal must be able to be removed from the IPT for installations where only 3-wires exist or are available between where the IPT will be placed and its connection with the HVAC unit it will be controlling. Over these 3-wires the thermostat must still be able to control the HVAC unit based on these specifications.

D. The IPT must be configurable using a Web Based App. No thermostat configuration, other than setting the IPT to Conventional, Heat Pump - O, or Heat Pump -B, shall be done at the thermostat. Web based Configuration Setting options shall include:

   1. Naming the thermostat.

2. Grouping multiple thermostats.
3. Heat Pump or Conventional system setting.
4. If Heat Pump; reversing valve O or B setting.
5. Cycles Per Hour (1 - 6).
6. Anticipation Degrees (0˚F - 0.5˚F)
7. Calibration Degrees (2.0˚F - -2.0˚F)
8. Heat Stages (0 - 2)
9. If Heat Pump; Aux Heat (Disabled and/or Enabled Option)
10. Cool Stages (0 - 2)
11. Fan Stages (1 - 2)
12. Fan Circulation Minutes Per Hour.
13. Temperature Display (Fahrenheit or Celsius)
14. Heat Range Temperature Setting Limitation
15. Cool Range Temperature Setting Limitation
16. Ability to disable and enable Keypad Control through schedule.
17. Heat consumption (kw, btu, ton, or watt)
18. Cool consumption (kw, btu, ton, or watt)
19. Notification Sensitivity (High, Medium, Low)
20. Alarm of exceeding temperature based on a Safe Range
21. Schedule set times (2, 3, 4, or Variable).

E. IPT settings and control through the Web Base App shall be in real-time and include:

1. Space Temperature
2. System Mode (Heat, Cool, Auto, Off).
3. Fan Mode (Auto, On).
4. Current set point.
5. Relay status (Heat/Cool and Fan).
6. Historical Trend Graphs.
7. Scheduling
8. Lock and Unlock Entire Thermostat's Keypad
9. Lock and Unlock the Thermostat's Fan Mode setting Only

2.04 WEB BASED GRAPHICAL USER INTERFACE

A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.

B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML5.

C. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Energy Management System.

D. The Web Based client shall support at a minimum, the following functions:
   1. User log-on identification and password shall be required.
   2. HTML programming shall not be required to display any graphics or data on the Web page.
   3. Storage of data shall reside within the cloud server and shall not sit within the client's computer or device. EMS that requires data storage on a client computer or an on-site server is not acceptable.
   4. Users shall have administrator and user definable access privileges.
   5. OpenAPI interface with XML data output.

E. Schedules:
   1. The WBA shall provide user with access to setting Internet Programmable Thermostat (IPT) schedules. Up to 12 schedule periods per day shall be available for each IPT.
   2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
   3. The WBA shall provide the user the ability to:
      a. View Schedules.
      b. Add/Modify Schedules.
      c. Assign Thermostat to a Group Schedule.
      d. Delete Schedules.

F. Trending
   1. The WBA shall provide real-time trend information on:
      a. Each IPT's space temperature.
      b. Each IPT's temperature set points.
      c. Each IPT's current call; heat, cool, and/or fan.
      d. Each IEE's call for economization
   2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
      a. Space temperature; with resolution of every 1/10th of a degree Fahrenheit.
      b. IPT's temperature set points.
      c. Indication of whether the thermostat was calling for; heat, cool, and/or fan.
   3. Trend data shall be viewable on the WBS

G. Alarm Notifications
   1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
      a. Space temperature and temperature change.
      b. IPT's temperature set points.
      c. IPT's current call; heat, cool, and/or fan.
   2. The WBA shall be able to provide a user with the ability to:
      a. View Alarms.
      b. Set Alarm Notification sensitivity level to High, Medium, or Low.
      c. Delete Alarms.
   3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

H. Consumption Usage
   1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.

2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the EMS.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

2.05 WIRED REMOTE TEMPERATURE SENSORS AND DIGITAL ALARM INPUT

A. Input Temperature Sensor (ITS).
1. The ITS shall connect to the Internet Programmable Thermostat over 3-wires.
2. ITS shall provide at least one external 10K Type II thermistor temperature sensor input.
3. Web Based App shall be able to record and provide at least two years of past temperature data for ITS.
4. The trend data shall be viewable on the WBA.
5. ITS must be accurate to ±1.0˚F
6. ITS must be able to be installed up to 500’ away from IPT using standard thermostat wiring.

2.06 INTERNET ENABLED ECONOMIZER (IEE)

A. The IEE shall connect to the Internet Programmable Thermostat (ITS) with ONLY 3-wires. No additional wiring must be required between the IEE and the ITS to gain complete Title 24 compliant economization control.
B. IEE shall provide up to three 10K Type II external thermistor temperature sensor input.
C. Web Based App shall be able to record and provide at least two years of past data for IEE. Data must represent historical representations of:
1. Calls for Economization
2. Outside Air Damper Position
3. Supply and Outside Air Temperature
D. The trend data shall be viewable on the WBA.
E. IEE must be able to send California Title 24 Fault and Diagnostics codes to the WBA, email addresses, and or text messages.
F. IEE must be able to be installed up to 500’ away from IPT using standard thermostat wiring.
G. IEE must have a settable 0-10VDC output for Outside Air Damper Actuator control.
H. IEE must have a settable 0-10VDC output for Variable Frequency Drive (VFD) control.
1. IEE must be configurable for different VFD speeds based on calls for cold, heat, and ventilation.
I. IEE must have a 0-10VDC input for Outside Air Damper Position Feedback.

2.07 WIRELESS PROXIMITY SENSORS

A. Wireless Proximity Sensor (WPS).
1. The WPS shall connect with the Internet Programmable Thermostat over the 802.15.4 wireless network.
2. WPS shall be powered by 2 AA batteries or equivalent.
3. WPS must be able to be used for either:
a. Accepting a motion sensor’s 2-wire dry contact output.
1) The WPS shall be able to notify an Internet Programmable Thermostat if a motion sensor’s dry contact is in either the open or closed position.

2) Dry contact open positions will indicate that the space is occupied and the IPT must be able to automatically setback its temperature setting by a range of 0F - 10 or OFF.

3) Dry contact closed position will indicate that the space is unoccupied and set the temperature to a comfort setting when the space is occupied.

4) Setback settings and comfort settings must be settable through the Internet Programmable Thermostat's schedule through the Web Based App (cannot be settable at thermostat).

5) Web Based App must be able to display when a space is "Unoccupied".

b. Detecting if a Window OR Door is Opened or Closed.

1) The WPS must have a built-in magnetic sensor and come with a magnet that can be installed on a door OR window.

2) The WPS must be able to notify an Internet Programmable Thermostat if the door is open and the IPT must automatically turn to the OFF position.

3) The WPS must be able to notify an Internet Programmable Thermostat if the door is closed and the IPT must automatically return to its last temperature and system settings.

4) Web Based App must be able to display when the Door OR Window is Open and must be able to be set to indicate "Door" or "Window".

B. Web Based App shall be able to notify if the WPS batteries are low and record and provide at least two years of past history on occupancy and/or door/window status for each space a WPS is installed in.

C. The trend data shall be viewable on the Web Based App.

D. Internet Programmable Thermostat must be able to connect with at least 8 WPS, each WPS must have a unique serial number and each WPS shall be settable, through the Web Based App as either a motion sensor input or as a door/window sensor.

PART 3 – EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. General
1. Installation of the Energy Management System shall be performed by an approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.

B. Demolition
1. Remove controls which do not remain as part of the Energy Management System. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

C. Access to Site
1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.

D. Code Compliance
1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

E. Cleanup
   1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.02 WIRING, CONDUIT, AND CABLE

A. All control wires between HVAC units and thermostat locations to be furnished and installed by others. The EMS contractor shall not begin work on this contract until all wiring is installed to the satisfaction of the EMS contractor. The EMS contractor shall provide wiring between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

3.03 HARDWARE INSTALLATION

A. Installation Practices for Devices
   1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

B. Identification
   1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
   2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
   3. Junction box covers will be marked to indicate that they are a part of the EMS system.
   4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
   5. All I/O field devices inside FIP's shall be labeled.

C. Existing Controls.
   1. Existing controls are not to be reused. All EMS devices will be new.

D. Control System Switch-over
   1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

E. Location
   1. The location of sensors is per mechanical and architectural drawings.
   2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.
   3. If Input Temperature Sensor(s) (ITS) is used as Outdoor air sensor, Outdoor air sensors will be mounted on the north building face directly in the outside air. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
   4. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

3.04 SYSTEM PROGRAMMING

A. General.
   1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.

2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

3.05 COMMISSIONING AND SYSTEM STARTUP

A. EMS device functional testing.
   1. Each system for which a EMS device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud based servers and responding in accordance with manufacture's specifications.

END OF SECTION

SECTION 23 11 23
FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes distribution piping systems for natural gas and manufactured gas within the building and extending from the point of delivery to the building to the connections with gas utilization devices. Piping materials and equipment specified in this Section include:
   1. Pipes, fittings, and specialties of domestic manufacture.
   2. Special duty valves of domestic manufacture.

B. This Section does not apply to LP-gas piping; industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen; gas piping, meters, gas pressure regulators and other appurtenances used by the serving gas supplier in distribution of gas.

C. Natural gas yard piping is not included in this section.

D. Gas pressures for systems specified in this section are limited to 5 PSIG, unless otherwise specified.

E. Products not furnished under this Section include gas meters which will be provided by the utility company, to the site, ready for installation.

1.02 RELATED SECTIONS

A. The following Sections contain requirements that relate to this Section:
   1. Division 33 Section "Natural Gas Yard Piping" for fuel gas service piping, which is underground, outside the building, and connecting the "Gas Distribution Piping" to public utilities (or connecting groups of buildings on the same site).
   2. Division 23 Section "HVAC Identification" for labeling and identification of gas piping systems.

1.03 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Gas Distribution Piping: A pipe within the building which conveys gas from the point of delivery to the points of usage.

C. Gas Yard Piping: That portion of gas distribution system which is underground.

D. Gas Service Piping: The pipe from the gas main or other source of supply including the meter, regulating valve, or service valve to the gas distribution system and/or gas yard piping system being served.

E. Point of Delivery is the outlet of the service meter assembly, or the outlet of the service regulator (service shutoff valve when no meter is provided).

1.04 SUBMITTALS

A. Product data for each gas piping specialty and special duty valves. Include rated capacities of selected models, furnished specialties and accessories, and installation instructions.

B. Maintenance data for gas specialties and special duty valves, for inclusion in operating and maintenance manual specified in Division 01 and Division 23 Section "Common Work Results for HVAC."

C. Test reports specified in Part 3. Submit for inclusion in operating and maintenance manual.

1.05 QUALITY ASSURANCE

A. Installation Qualifications: Installation and replacement of gas piping, gas utilization equipment or accessories, and repair and servicing of equipment shall be performed only by a qualified installer. The term qualified is defined as experienced in such work (experienced shall mean having a minimum of 5 previous projects similar in size and scope to this project), familiar with precautions required, and has complied with the requirements of the authority having jurisdiction. Upon request, submit evidence of such qualifications to the Architect.

B. Qualifications for Welding Processes and Operators: Comply with the requirements of ASME Boiler and Pressure Vessel Code, "Welding and Brazing Qualification."

C. Regulatory Requirements: Comply with the requirements of the following codes:
   1. NFPA 54 - National Fuel Gas Code, for gas piping materials and components, gas piping installations, and inspection, testing, and purging of gas piping systems.
   2. California Plumbing Code (CPC).

1.06 SEQUENCING AND SCHEDULING

A. Notification of Interruption of Service: Except in the case of an emergency, notify all affected users when the gas supply is to be turned off.

B. Work Interruptions: When interruptions in work occur while repairs or alterations are being made to an existing piping system, leave the system in safe condition.

C. Coordinate the installation of pipe sleeves for wall penetrations.

1.07 EXTRA MATERIALS

A. Valve wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide gas piping system products from one of the following:
   1. Gas service cocks: Semi-steel 175 pound with tapered bronze plug and bolted yoke. Furnish one operating wrench for each valve.
      a. Powell Fig. 2200 & 2201.
      b. Nordstrom Fig. 142 & 143.
      c. Walworth Fig. 1796 & 1797F.
      d. Homestead Fig. 611 & 612.
   2. Gas valves at equipment: All bronze, flathead screwed gas cocks.
      a. Powell Fig. 947.
      b. Crane Fig. 270.
      c. Healey Fig. 20F..
      d. Walworth Fig. 591

2.02 PIPE AND TUBING MATERIALS

A. General: Refer to Part 3, Article "PIPE APPLICATIONS" for identification of systems where the below specified pipe and fitting materials are used.

B. Steel Pipe: ASTM A 53, Schedule 40, seamless, black steel pipe, beveled ends.

2.03 FITTINGS

A. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.
   1. Joint compound or tape suitable for gas being handled.

B. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

C. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:
   1. Material Group: 1.1
   2. End Connections: Butt Welding.
   3. Facings: Raised face.

2.04 PIPING SPECIALTIES

A. Unions: ANSI B16.39, Class 150, black malleable iron; female pattern; brass to iron seat; ground joint.

B. Dielectric Unions: ANSI B16.39, Class 250; malleable iron and cast bronze; with threaded or soldered end connections suitable for pipe to be joined; designed to isolate galvanic and stray current corrosion.

C. Protective Coating: When piping will be in contact with material or atmosphere exerting a corrosive action, pipe and fittings shall be factory-coated with polyethylene tape, having the following properties:
   1. Overall thickness; 20 mils.
   2. Synthetic adhesive.
   3. Water vapor transmission rate, gallons per 100 Square Inch; 0.10 or less.
   4. Water absorption, percent; 0.02 or less.
   5. Prime pipe and fittings with a compatible primer prior to application of tape.

2.05 VALVES

A. Gas Cocks 2 inch and Smaller: 150 PSI WOG, bronze body, straightaway pattern, square head, threaded ends.

B. Gas Cocks 2-1/2" Inch and Larger: MSS SP-78; 175 PSI, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.

C. Ball Valves: Rated for 400 PSI WOG pressure, two-piece construction; with bronze body conforming to ASTM B62, Standard (or regular) post, chrome plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl covered steel handle; with threaded ends.

D. Solenoid Valves: aluminum body, 120 Volts AC, 60 Hz, Class B continuous duty molded coil NEMA 4 coil enclosure; electrically opened/electrically closed; dual coils; normally closed; UL and FM approved and labeled.

E. Gas Line Pressure Regulators: Single stage, steel jacketed, corrosion-resistant gas pressure regulators; with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends for 2-1/2 inch and larger; for inlet and outlet gas pressures, specific gravity, and volume flow indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Precautions: Before turning off the gas to the premises, or section of piping, turn off all equipment valves. Perform a leakage test as specified in "FIELD QUALITY CONTROL" below, to determine that all equipment is turned off in the piping section to be affected.

B. Conform to the requirements in NFPA 54, for the prevention of accidental ignition.

3.02 PIPE APPLICATIONS

A. Install steel pipe above ground with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2" inch and larger.

3.03 PIPING INSTALLATIONS

A. General: Conform to the requirements of NFPA 54 - National Fuel Gas Code.

B. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Design locations and arrangements of piping. Take into consideration pipe sizing, flow direction, slope of pipe, expansion, and other design considerations. So far as practical, install piping as indicated.

C. Concealed Locations: Except as specified below, install concealed gas piping in an air-tight conduit constructed of Schedule 40, seamless black steel with welded joints. Vent conduit to the outside and terminate with a screened vent cap.
   1. Above-Ceiling Locations: Gas piping may be installed in accessible above-ceiling spaces (subject to the approval of the authority having jurisdiction) whether, or not such spaces are used as a plenum. Valves shall not be located, in such spaces.
   2. Piping in Partitions: Concealed piping shall not be located, in solid partitions.
   3. Prohibited Locations: do not install gas piping in or through a circulating air duct, clothes chute, chimney or gas vent, ventilating duct, dumb-waiter, or elevator shaft.

D. Install pipe sleeve seals at foundation penetrations.

E. Seal pipe penetrations of fire barriers using fire barrier penetration sealers acceptable to State Fire Marshal.

F. Use fittings for all changes in direction and all branch connections.
   1. Weld-o-lets may be used in lieu of tees for branch connections two sizes or more, smaller than main.
   2. Mitered elbows or tees not permitted.

G. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.

H. Install piping free of sags or bends and with ample space between piping.

I. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

J. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Allow sufficient space above removable ceiling panels to allow for panel removal.

K. Locate groups of pipes parallel to each other, spaced to permit servicing of valves.

L. Install gas piping at a uniform grade of 1/4 inch in 15 feet, upward to risers, and from the risers to the meter, or service regulator when meter is not provided, or the equipment.

M. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

N. Connect branch outlet pipes from the top or sides of horizontal lines, not from the bottom.

O. Hangers, supports, and anchors are specified in Division 22 Section "Supports and Anchors." Conform to the table below for maximum spacing of supports:

SIZE (NPS)	SPACING IN FT.	MIN. ROD SIZE IN IN.
1/2	5	3/8
3/4 to 1-1/4	6	3/8
1-1/2 to 3 (horizontal)	12	1/2
3-1/2 to 5 (vertical)	all sizes every floor level	

P. Install unions in pipes 2 inches and smaller, adjacent to each valve, at final connections each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

Q. Install dielectric unions where piping of dissimilar metals is joined.

R. Install flanges on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

S. Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, and elsewhere as indicated.

T. Anchor piping to ensure proper direction of expansion and contraction. Install expansion loops and joints as indicated on the Drawings and specified in Division 23 Section "Common Work Results for HVAC."

3.04 PIPE JOINT CONSTRUCTION

A. Welded Joints: Comply with the requirements in ASME Boiler and Pressure Vessel Code, Section IX.

B. Threaded Joints: Conform to ANSI B1.20.1 tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:
   1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint. Refer to NFPA 54, for guide for number and length of threads for field threading steel pipe.
   2. Align threads at point of assembly.
   3. Apply appropriate tape or thread compound to the external pipe threads.
   4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
   5. Damaged Threads: Do not use pipe with threads which are corroded, or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

C. Flanged Joints: Align flange surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

3.05 VALVE APPLICATION

A. General: The drawings indicate valve types, locations, and arrangements.

B. Shut-off duty: Use gas cocks specified in Part 2 above.

3.06 VALVE INSTALLATION

A. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached with a metal chain indicating the piping systems supplied.

B. Install a gas cock upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.

C. Install ball valves in all locations required for quick emergency shut off.

D. Install pressure relief or pressure limiting devices so they can be readily operated to determine if the valve is free so they can be tested to determine the pressure at which they will operate; and examined for leakage when in the closed position.

E. Install low pressure gas check in primary gas supply line to each laboratory room. Valve to be installed immediately downstream of manual emergency shut off valve.

3.07 TERMINAL EQUIPMENT CONNECTIONS

A. Install gas cocks upstream and within 6 feet of gas appliance. Install a union or flanged connection downstream from the gas cock to permit removal of controls.

B. Sediment Traps: Install a tee fitting with the bottom outlet plugged or capped as close to the inlet of the gas appliance as practical. Drip-leg shall be a minimum of 3 pipe diameters in length.

3.08 ELECTRICAL BONDING AND GROUNDING

A. Install above ground portions of gas piping systems, upstream from equipment shutoff valves electrically continuous and bonded to a grounding electrode in accordance with NFPA 70 "National Electrical Code."

B. Do not use gas piping as a grounding electrode.

C. Conform to NFPA 70 "National Electrical Code," for electrical connections between wiring and electrically operated control devices.

3.09 FIELD QUALITY CONTROL

A. Piping Tests: Inspect, test, and purge natural gas systems in accordance with NFPA 54, and local utility requirements.

B. Prepare test reports and submit.

END OF SECTION

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

B. Related Sections include the following:
   1. List below only products that the reader might expect to find in this Section but are specified elsewhere.
   2. Division 01 Section "Roof Accessories" for roof curbs, piping supports, and roof penetration boots.
   3. Division 01 Section "Through-Penetration Fire-stop Systems" for materials and methods for sealing pipe penetrations through fire and smoke barriers.
   4. Division 01 Section "Joint Sealants" for materials and methods for sealing pipe penetrations through exterior walls.
   5. Division 23 Section "Supports and Anchors" for pipe supports and installation requirements.
   6. Delete first subparagraph below if requirements in Division 23 Section "Common Work Results for HVAC" are sufficient.
   7. Division 23 Section "HVAC Identification" for labeling and identifying refrigerant piping.
   8. Division 23 Section "Meters and Gages" for thermometers and pressure gages.

1.03 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated, include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.

C. Refrigerant piping indicated is schematic only. Size piping and design the actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals specified in Division 01.

1.04 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX; "Welding and Brazing Qualifications."

B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration." ASHRAE 15 – Safety Code for Mechanical Refrigeration & ASHRAE 34 - Number Designation of Refrigerants.

C. ASME Standard: Comply ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings. ASME B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes. ASME B31.5 – Refrigeration Piping. ASME B31.9 – Building Services Piping. ASTM Standard: Comply with ASTM B88 – Seamless Copper Water Tube. ASTM B280 - Seamless Copper Tube for Air

Conditioning and Refrigeration Field Service. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

E. Comply with ARI 710 - Liquid Line Dryers. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers.

F. Comply with AWS A5.8 - Brazing Filler Metal.

G. Comply with MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer. MSS SP69 - Pipe Hangers and Supports - Selection and Application. MSS SP89 – Pipe Hangers and Supports - Fabrication and Installation Practices.

1.05 COORDINATION

A. Coordinate layout and installation of refrigerant piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

D. Coordinate pipe sleeve installations for penetrations in exterior walls and floor assemblies. Coordinate with requirements for fire-stopping specified in Division 07 Section "Through-Penetration Fire-stop Systems" for materials and methods for sealing pipe penetrations through fire and smoke barriers.

E. Coordinate pipe fitting pressure classes with products specified in related Sections.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

1.07 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this section with minimum three years documented experience.

B. Design piping system under direct supervision of a Professional Engineer experienced in design of this work, licensed in one of the states of the United States of America, and employed or approved by the manufacturer of the equipment.

1.08 REGULATORY REQUIREMENTS

A. Conform to IMC ASME B31.9 for installation of piping system.

B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refrigerants:
      a. Allied Signal, Inc./Fluorine Products; Genetron Refrigerants.
      b. DuPont Company; Fluorochemicals Div.
      c. Elf Atochem North America, Inc.; Fluorocarbon Div.

d. ICI Americas Inc./ICI KLEA; Fluorochemicals Bus.

2. Refrigerant Valves and Specialties:
   a. Climate & Industrial Controls Group; Parker-Hannifin Corp.; Refrigeration & Air Conditioning Division.
   b. Danfoss Electronics, Inc.
   c. Emerson Electric Company; Alco Controls Div.
   d. Henry Valve Company.
   e. Sporlan Valve Company.

2.02 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: [ASTM B 280, Type ACR]

B. Annealed-Temper Copper Tube: [ASTM B 280, Type ACR]

C. Wrought-Copper Fittings: ASME B16.22.

D. Wrought-Copper Unions: ASME B16.22.

E. Bronze Filler Metals: AWS A5.8, Classification BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 deg. F.

2.03 VALVES

A. Diaphragm Pack-less Valves: 500 PSIG working pressure and 275 deg. F. working temperature; globe design with straight-through or angle pattern; forged-brass or bronze body and bonnet, phosphor bronze and stainless-steel diaphragms, rising stem and handwheel, stainless-steel spring, nylon seat disc, and with solder-end connections.

B. Packed-Angle Valves: 500 PSIG working pressure and 275 deg. F. working temperature; forged-brass or bronze body, forged-brass seal caps with copper gasket, back seating, rising stem and seat, molded stem packing, and with solder-end connections.

C. Check Valves Smaller Than NPS 1 (DN 25): 400 PSIG operating pressure and 285 deg. F. operating temperature; cast-brass body, with removable piston, polytetrafluoroethylene seat and stainless-steel spring, globe design. Valve shall be straight-through pattern, with solder-end connections.

D. Check Valves, NPS 1 and Larger: 400 PSIG operating pressure and 285 deg. F. operating temperature, cast-bronze body with cast-bronze or forged brass bolted bonnet, floating piston with mechanically retained polytetrafluoroethylene seat disc. Valve shall be straight-through or angle pattern, with solder-end connections.

E. Service Valves: 500 PSIG pressure rating; forged-brass body with copper stubs, brass caps, removable valve core, integral ball check valve, and with solder-end connections.

F. Solenoid valves below are made normally closed and normally open. Normally closed are direct acting and pilot operated. Holding coils are available in several voltages. Manual operator is optional.

G. Solenoid Valves: Comply with ARI 760; 250 deg. F. temperature rating and 400 PSIG working pressure, forged brass with polytetrafluoroethylene valve seat, 2-way straight-through pattern and solder-end connections, manual operator fitted with suitable NEMA rated enclosure of type required by location with ½ “(16-GRC) conduit adapter and [24] [120]-V, normally [closed] [open] holding coil.

H. Pressure-Regulating Valves: Comply with ARI 770; pilot operated, forged brass, or cast bronze, stainless-steel bottom spring, pressure-gage tapping, 24-V dc standard coil, and wrought-copper fittings for solder-end connections; suitable for refrigerant specified.

I. Pressure-Regulating Valves: Comply with ARI 770; direct acting, brass; with pilot operator, stainless-steel diaphragm, standard coil, and solder-end connection; suitable for refrigerant specified.

J. Pressure Relief Valves: Straight-through or angle pattern, brass body and disc, neoprene seat, and factory sealed and ASME labeled for standard pressure setting.

K. Thermostatic expansion valves below are factory adjusted to proper superheat settings for evaporator before shipment. Fine tuning is not normally required unless application or operation conditions are different from those anticipated.

L. Thermostatic Expansion Valves: Comply with ARI 750; brass body with stainless-steel parts, thermostatic adjustable modulating type, size and operating characteristics as recommended by manufacturer of evaporator and factory set for superheat requirements, solder-end connections with sensing bulb, distributor having side connection for hot-gas bypass line, and external equalizer line.

M. Hot-Gas Bypass Valve: Pulsating-dampening design, stainless-steel bellows, and polytetrafluoroethylene valve seat; adjustable; sized for capacity equal to last step of compressor unloading; with solder-end connections.

2.04 REFRIGERANT PIPING SPECIALTIES

A. Straight- or Angle-Type Strainers: 500 PSIG working pressure; forged-brass or steel body with stainless-steel wire or brass reinforced Monel screen of 80 to 100 mesh in liquid lines up to 1 1/8 inches, 60 mesh in larger lines and 40 mesh in suction lines with screwed cleanout plug and solder-end connections.

B. Moisture/Liquid Indicators: 500 PSIG maximum working pressure and 200 deg. F. operating temperature, all brass body with replaceable polished optical viewing window with color-coded moisture indicator; with solder-end connections.

C. Replaceable-Core Filter-Dryers: 500 PSIG maximum working pressure; heavy gage protected with corrosion-resistant painted steel shell, flanged ring and spring, ductile-iron cover plate with steel cap screws, wrought-copper fittings for solder-end connections with replaceable-core kit, including gaskets and the following:

D. Permanent Filter-Dryer: 350 PSIG maximum operating pressure and 225 deg. F. maximum operating temperature; steel shell and wrought-copper fittings for solder-end connections, molded-felt core surrounded by desiccant.

E. Mufflers: 500 PSIG operating pressure, welded-steel construction with fusible plug; sized for refrigeration capacity.

2.05 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless-steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 500 PSIG.

2.06 RECEIVERS

A. Receivers, 6-Inch Diameter and Smaller: ARI 495, UL listed, steel, brazed, 400 PSIG pressure rating, with tapping for inlet, outlet, and pressure relief valve.

B. Receivers Larger Than 6-Inch Diameter: ARI 495, welded steel, tested and stamped according to ASME Boiler and Pressure Vessel Code: Section VIII; 400-psig pressure rating, with tapping for liquid inlet and outlet valves, pressure relief valve, and liquid-level indicator.

2.07 REFRIGERANTS

A. ASHRAE 34, R-410A.

2.08 DRAIN PIPING

A. Type DWV copper with wrought copper fittings.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Aboveground, within Building: Type ACR drawn-copper tubing.

B. Belowground for NPS 2 and Smaller: Type L annealed-copper tubing.

3.02 VALVE APPLICATIONS

A. Install diaphragm pack-less or packed-angle valves in suction and discharge lines of compressor, for gage taps at hot-gas bypass regulators, on each side of strainers.

B. Install check valves in compressor discharge lines and in condenser liquid lines on multiple condenser systems.

C. Install packed-angle valve in liquid line between receiver shutoff valve and thermostatic expansion valve for system charging.

D. Install diaphragm pack-less or packed-angle valves on each side of strainers and dryers, in liquid and suction lines at evaporators, and elsewhere as indicated.

E. Install a full-sized, three-valve bypass around each dryer.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve.

G. Install solenoid valves in horizontal lines with coil at top. Electrical wiring for solenoid valves is specified in Division 26 Sections. Coordinate electrical requirements and connections. Install thermostatic expansion valves as close as possible to evaporator.

H. If refrigerant distributors are used, install them directly on expansion-valve outlet.
   1. Install valve so diaphragm case is warmer than bulb.
   2. Verify proper location for bulb with valve manufacturer.
   3. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
   4. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

I. Install pressure-regulating and pressure relief valves as required by ASHRAE 15. Pipe pressure relief valve discharge to outside.

3.03 SPECIALTY APPLICATIONS

A. Install liquid indicators in liquid line leaving condenser, in liquid line leaving receiver, and on leaving side of liquid solenoid valves.

B. Install strainers immediately upstream from each automatic valve, including expansion valves, solenoid valves, hot-gas bypass valves, and compressor suction valves.

C. Install strainers in main liquid line where multiple expansion valves with integral strainers are used.

D. Install strainers in suction line of steel pipe.

E. Install moisture-liquid indicators in liquid lines between filter-dryers and thermostatic expansion valves and in liquid line to receiver.

F. Install pressure relief valves on ASME receivers; pipe discharge to outdoors.

G. Install replaceable-core filter-dryers in vertical liquid line adjacent to receivers and before each solenoid valve.

H. Install permanent filter-dryers in low-temperature systems, in systems using hermetic compressors, and before each solenoid valve.

I. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

J. Install receivers, sized to accommodate pump-down charge, on systems 5 tons and larger and on systems with long piping runs.

K. Install flexible connectors at or near compressors where piping configuration does not absorb vibration.

3.04 PIPING INSTALLATION

A. Install refrigerant piping according to ASHRAE 15.

B. Install refrigeration specialties in accordance with manufacturer's instructions.

C. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations and locations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Continuously purge piping system with nitrogen when brazing.

I. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

J. Insulate piping; refer to Section 23 07 00.

K. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

L. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

M. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

N. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

O. Fully charge completed system with refrigerant after testing.

P. Provide electrical connection to solenoid valves.

Q. Basic piping installation requirements are specified in Division 23 Section "Common Work Results for HVAC."

R. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

S. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.

T. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation. Install pipes with proper clearance between the liquid and suction lines.

U. Belowground, install copper tubing in protective water-tight flexible PVC conduit. Vent conduit outdoors.

V. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

W. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor. slope approximately 1 inch every 20 feet to better facilitate oil return.
3. Use double-suction riser for maximum compressor efficiencies if load variation is expected.
4. Install traps and double risers to entrain oil in vertical runs.
5. Liquid lines may be installed level.

X. Install bypass around moisture-liquid indicators in lines larger than NPS 2.

Y. Install unions to allow removal of solenoid valves, pressure-regulating valves, and expansion valves and at connections to compressors and evaporators.

Z. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

AA. Hanger, support, and anchor products are specified in Division 23 Section "Supports and Anchors."

BB. Install the following pipe attachments: Install trapeze or other pipe supports per contract document drawings and details. If details are not shown, provide:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe rollers for multiple horizontal runs 20 feet or longer, supported by a trapeze.
4. Spring hangers to support vertical runs.

CC. Support vertical runs at each floor.

3.05 PIPE JOINT CONSTRUCTION

A. Braze joints according to Division 23 Section "Common Work Results for HVAC."

B. Braze all copper to-copper joints with Silfos-5 or equal brazing materials. Do not use soft solder.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.

3.06 FIELD QUALITY CONTROL

A. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.
1. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.

B. System shall maintain test pressure at the manifold gage throughout duration of test.
1. Test joints and fittings by brushing a small amount of soap and glycerine solution over joint.
2. Fill system with nitrogen to raise a test pressure of 150 psig or higher as required by authorities having jurisdiction.
3. Remake leaking joints using new materials and retest until satisfactory results are achieved.

3.07 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of the conditioned air controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
   1. Open shutoff valves in condenser water circuit.
   2. Check compressor oil level above center of sight glass.
   3. Open compressor suction and discharge valves.
   4. Open refrigerant valves, except bypass valves that are used for other purposes.
   5. Check compressor-motor alignment and lubricate motors and bearings.

3.08 CLEANING

A. For copper tubing other than Type ACR, clean tubing and fittings of the approved materials with trichloroethylene.

B. Replace core of filter-dryer after system has been adjusted and design flow rates and pressures are established.

3.09 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Install core in filter-dryer after leak test but before evacuation.
   2. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
   3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 PSIG.
   4. Charge system with a new filter-dryer core in charging line. Provide full-operating charge.

END OF SECTION

SECTION 23 31 13
METAL DUCTWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Rectangular and round metal ducts and plenums for heating, ventilating, and air conditioning system from minus 2" to plus 5" Water Gage.

1.02 RELATED SECTIONS

A. Refer to other Division 23 Sections for exterior insulation of metal ductwork; not work of this section.

B. Refer to other Division 23 Sections for ductwork accessories; not work of this section.

C. Refer to other Division 23 Sections for fans and air handling units; not work of this section.

D. Refer to other Division 23 Sections for testing, adjusting, and balancing of metal ductwork systems; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for metal ductwork materials and products.

B. Record Drawings: At project closeout, submit record drawings of installed metal ductwork and ductwork products, in accordance with requirements of Division 01.

C. Maintenance Data: Submit maintenance data and parts lists for metal ductwork materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual in accordance with requirements of Division 01.

1.04 QUALITY ASSURANCE

A. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with metal ductwork systems similar to that required for project.

B. Codes and Standards:
   1. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal ductwork.
   2. ASHRAE Standards: Comply with ASHRAE Handbook, Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of metal ductwork.
   3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" and NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

C. Field Reference Manual: Have available for reference at project field office, copy of SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protection: Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage, and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

B. Storage: Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.01 DUCTWORK MATERIALS

A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including but not limited to those which would impair painting.

B. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A653/A653M, lock forming quality, with G90 zinc coating in accordance with ASTM A653/A653M; and mill phosphatized for exposed locations.

2.02 MISCELLANEOUS DUCTWORK MATERIALS

A. General: Provide miscellaneous materials and products of types and sizes indicated or, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

B. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 18-degree change of direction per section. Unless specifically detailed otherwise, use 45-degree laterals and 45-degree elbows for branch takeoff connections. Where 90-degree branches are indicated, provide conical type tees.

C. Screws and bolts shall be cadmium plated.

D. Duct Liner: Permacote Linacoustic (rectangular), Permacote Spiracoustic (Round), complying with Thermal Insulation Manufacturer's Association (TIMA) AHC-101; of thickness indicated. 1 inch thick; 2" thick above roofline, unless indicated otherwise. Or approved equal.

E. Duct Liner Adhesive: Comply with ASTM C 916 "Specifications for Adhesives for Duct Thermal Insulation". Adhesive used on the project shall meet the requirements of CalGreen Section 5.504.4.1.

F. Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards, Article S2.11.

G. Duct Sealant: Non-hardening, non-migrating mastic, or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Sealant used on the project shall meet the requirements of CalGreen Section 5.504.4.1.

H. Duct Cement. Non-hardening migrating mastic or liquid neoprene-based cement, type applicable for fabrication/installation detail, as compounded, and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork. Cement used on the project shall meet the requirements of CalGreen Section 5.504.4.1.

I. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

J. Flexible ducts: Manufacturer based upon Casco Model Silent Flex II. Equal products by Thermaflex or approved equal. Insulated flexible ductwork shall be a factory fabricated assembly composed of a high carbon spring steel wire with a non-corrosive zinc coating spiral helix permanently bound to a spun-bonded nonwoven nylon interior liner and supporting a fiberglass insulating blanket with a polyethylene jacket vapor barrier. Working pressure: + 1-1/2” W.G. minimum, complying with UL 181; with factory installed metal collar connectors, maximum length 6 feet. Suspend at maximum 3’-0” O.C.

K. Under slab Ducts: For ductwork placed in concrete slabs, or under slabs on grade, fabricate ductwork of one of the following materials:
   1. Galvanized Steel.

2.03 FABRICATION

A. Shop-fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible so-as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.

B. Shop-fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards". Ducts shall be fabricated of galvanized sheet metal no less than 24 gauge.

C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division 23 Section "Ductwork Accessories" for accessory requirements.

E. Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive and fasten with mechanical fasteners.

2.04 FACTORY FABRICATED LOW PRESSURE DUCTWORK

A. General: At Installer's option, provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct, and fittings.

B. Material: Galvanized sheet steel complying with ASTM A517, lock forming quality, with ASTM A525, G90 zinc coating, mill phosphatized.

C. Gage: 24-gage minimum for round and oval ducts and fittings, 4" through 24" diameter.

D. Elbows: One-piece construction for 90 degrees and 45-degree elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.

E. Divided Flow Fittings: 90-degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.

F. Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following or equal:
   1. Semco Mfg., Inc.
   2. United Sheet Metal Div. United McGill Corp.
   3. Or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. General: Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF METAL DUCTWORK

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type, which will hold ducts true-to-shape, and to prevent buckling. Support vertical ducts at every floor.

B. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

C. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above

suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

D. Electrical Equipment Spaces: Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.

E. Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.

F. Where ducts pass through fire-rated floors, walls, or partitions, provide fire stopping between duct and substrate.

G. Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls, and other associated work of ductwork system.

H. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards.

3.03 INSTALLATION OF DUCT LINER

A. General: Install duct liner utilizing duct liner fasteners in accordance with SMACNA HVAC Duct Construction Standards.

3.04 INSTALLATION OF FLEXIBLE DUCT

A. Maximum Length: For any duct run using flexible ductwork, do not exceed 5'-0" extended length.

B. Installation: Install in accordance with Section III of SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

C. Bends in flexible ducts shall have a radius of not less 1.5 times the internal diameters.

3.05 EQUIPMENT CONNECTIONS

A. General: Connect metal ductwork to equipment as indicated; provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

3.06 ADJUSTING AND CLEANING

A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances, which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

B. Temporary closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, or the period of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, provide temporary closure of duct openings and protection of mechanical equipment during construction.

C. All duct and other related air distribution component openings shall be covered with polyethylene film, tape, plastic, sheet metal or other methods acceptable to the enforcing agency which will prevent entrance of dust and debris.

D. Balancing: Refer to Division 23 Section "Testing, Adjusting and Balancing" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION

SECTION 23 33 00
DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Types of ductwork accessories required for project include the following:
   1. Dampers.
      a. Low pressure manual dampers
      b. Control dampers
      c. Counterbalanced relief dampers
   2. Fire and smoke dampers.
   3. Turning vanes.
   4. Duct hardware.
   5. Duct access doors.
   6. Flexible connections.

1.02 RELATED SECTIONS

A. Refer to other Division 23 Sections for testing, adjusting, and balancing of ductwork accessories; not included in work of this section.

B. Division 23 Section "Metal Ductwork."

C. Division 23 Section "HVAC Identification."

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
   2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
   3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
   4. Fire dampers shall bear California State Fire Marshal Listing Number.
   5. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

PART 2 - PRODUCTS

2.01 DAMPERS

A. Low Pressure Manual Dampers: Provide dampers of single blade type of multi-blade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards". "Jiffy" type dampers are not acceptable.

B. Manufacturers: Subject to compliance with requirements set forth in constriction documents, provide dampers of one of the following:
   1. Ruskin Manufacturing Co.
   2. Air Balance Co.
   3. Pottorff Company, Inc.

2.02 BACKDRAFT DAMPERS

A. General: Provide back-draft dampers of types and sizes indicated. Construct casings of 0.090-thickness aluminum with mitered corners.

B. Blades, 0.025" formed aluminum with extruded vinyl edge seals. Bearings, Zytel. Linkage 1/8" x 1/8" aluminum tie bars concealed in frame.

C. Counterbalance: Zinc plated bar on blades (except top blade). Adjustable for final setting Mill finish

D. Manufacturers: Subject to compliance with requirements, provide dampers of one of the following:
   1. Ruskin Manufacturing Co.
   2. Air Balance Co.
   3. Pottorff Company, Inc.

E. Control Dampers: Refer to Division 23 section "Sequence of Operation" for control dampers; not work of this section.

F. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga aluminum provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/2" x 16-ga channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.

G. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
   1. Air Balance, Inc.
   2. Ruskin Mfg. Co.
   3. Pottorff Company, Inc.

2.03 FIRE AND SMOKE DAMPERS

A. California State Fire Marshal approved, designed, and constructed in accordance with NFPA 90A and UL Standard 555 and bear stamp showing compliance.

B. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga galvanized steel. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) (unless otherwise indicated.) Provide damper with positive lock in closed position, and with the following additional features.
   1. Damper Blade Assembly: Curtain type.

C. Manufacturer: Subject to compliance with requirements, provide fire and smoke dampers of one of the following:
   1. Air Balance, Inc.
   2. Ruskin Mfg. Co.
   3. Pottorff Company, Inc.

2.04 TURNING VANES

A. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" O.C., supported with bars perpendicular to blades set at 2" O.C., and set into side strips suitable for mounting in ductwork.

B. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusion with perforated faces and fiberglass fill.

C. Manufacturer: Subject to compliance with requirements, provide turning vanes of one of the following:
   1. Aero Dynen Co.
   2. Airsan Corp.
   3. Anemostat Products Div.; Dynamics Corp. of America
   4. Barber-Colman Co.
   5. Duro Dyne Corp.
   6. Environmental Elements Corp. Subs, Koppers Co., Inc.
   7. Hart & Cooley Mfg. Co.

8. Register & Grille Mfg. Co., Inc.
9. Souther, Inc.

2.05 DUCT HARDWARE

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
   1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
   2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B. Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:
   1. Ventfabrics, Inc.
   2. Young Regulator Co.

2.06 DUCT ACCESS DOORS

A. General: Provide duct access doors where required.

B. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for un-insulated ductwork, extended frames for externally insulated duct. Provide one side hinged and other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

C. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:
   1. Air Balance Inc.
   2. Duro Dyne Corp.
   3. Register & Grille Mfg. Co., Inc.
   4. Ruskin Mfg. Co.
   5. Ventfabrics, Inc.
   6. Zurn Industries, Inc.; Air Systems Div.

2.07 FLEXIBLE CONNECTORS

A. General: Provide flexible duct connections wherever ductwork connects to vibration-isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement and, also capable of absorbing vibration of connected equipment.

B. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:
   1. American/Elgen Co.; Energy Div.
   2. Duro Dyne Corp.
   3. Flexaust (The) Co.
   4. Ventfabrics, Inc.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF DUCTWORK ACCESSORIES

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90-degree elbows in supply and exhaust air systems, and elsewhere as indicated.

C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.03 FIELD QUALITY CONTROL

A. Operate install ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.

3.04 ADJUSTING AND CLEANING

A. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
   1. Label access doors in accordance with Division 23 Section "HVAC Identification."
   2. Final positioning of manual dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.05 EXTRA STOCK

A. Furnish extra fusible links to Owner, one link for every 10 installed of each temperature range; obtain receipt.

END OF SECTION

SECTION 23 34 23
POWER AND GRAVITY VENTILATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Types of power and gravity ventilators specified in this section include the following:
   1. Power ventilators.
      a. Centrifugal roof ventilators.
      b. In-Line roof ventilators.
   2. Utility set ventilator.
   3. Gravity ventilators.
      a. Hooded gravity ventilators.
   4. Prefabricated roof curbs.

1.02 RELATED SECTIONS

A. Refer to Division 23 Section "Testing, Adjusting, And Balancing" for balancing of power and gravity ventilators; not work of this section.

B. Refer to Division 23 Section "Common Motor Requirements for Mechanical Equipment."

C. Refer to Division 26 Sections for the following work; not included in work of this section:
   1. Power supply wiring from power source to power connection on ventilators. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.

D. Refer to Division 23 Section “Vibration Control for HVAC.”

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for power and gravity ventilators, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.

B. Fan curve: Submit manufacturer’s fan curve data for power ventilators.
   1. For belt driven equipment, submit graph of fan curve with system curve that indicates intended point of operation. The graph shall also indicate manufacturer’s recommended operating range of fan curve.
   2. For direct driven equipment with speed controller, submit graph of fan curve with system curve that indicates intended point of operation. The graph shall also indicate manufacturer’s recommended operating range of fan curve. On the same graph, also provide fan curves representing maximum operating RPM and minimum operating RPM utilizing manufacturer’s speed controller.
   3. For direct driven equipment, submit graph of fan curve with system curve that indicates intended point of operation. The graph shall also indicate manufacturer’s recommended operating range of fan curve.

C. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.

D. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to power ventilators. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field installed.

E. Maintenance Data: Submit maintenance data and parts list for each type of power and gravity ventilator, accessory, and control. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 01.

F. Exhaust fan unit equipment manufacturer shall furnish calculations showing the estimated sound power levels for each supply air, return air and unit casing radiation for each exhaust fan unit.

G. The results of the tests shall be certified by the testing agency and submitted to the Architect for approval. The report shall include the manufacturer's designation of the tested unit, a complete description of the testing conditions, the measurement procedure, and the calculated PWL values (dB re. 10-12 watts), and calculations showing how the sound power levels were obtained from test data.

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. AMCA Compliance: Provide power ventilators, which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Rating Seal.
   2. UL Compliance: Provide power ventilators, which are designed, manufactured, and tested in accordance with UL 705 "Power Ventilators."
   3. NEMA Compliance: Provide motors and electrical accessories complying with NEMA Standards.

PART 2 - PRODUCTS

2.01 POWER VENTILATORS

A. General: Except as otherwise indicated, provide standard prefabricated power ventilator units of type and size indicated, modified as necessary to comply with requirements and as required for complete installation.

2.02 CENTRIFUGAL ROOF VENTILATORS (EXHAUST AND SUPPLY)

A. Centrifugal Roof Ventilators: Provide centrifugal roof type, curb mounted, power ventilators of type, size, and capacity as scheduled, and as specified herein.

B. Type: Centrifugal fan, direct or belt driven as scheduled. Provide aluminum, or fiberglass weatherproof housings as scheduled. Provide square base to suit roof curb.

C. Motors: Provide permanent split-capacitor type motor for direct driven fans; capacitor-start, induction-run type motor for belt driven fans.

D. Electrical: Provide factory-wired non-fusible type disconnect switch at motor in fan housing. Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection.

E. Bird Screens: Provide removable bird screen, 1/2" mesh 16-Ga. aluminum or brass wire.

F. Dampers: Provide gravity-actuated louvered dampers in curb bases unless noted to provide motorized louvered dampers with linkage in curb base.

G. Manufacturer: Subject to compliance with requirements, provide centrifugal roof ventilators of one of the following:
   1. Cook Co., Loren.
      Greenheck Fan Corp.
   2. Or approved equal.

2.03 UTILITY SET VENTILATOR

A. Description: Fan shall be a single width, single inlet, backward inclined flat blade, belt driven centrifugal vent set featuring spark resistant AMCA Type “A” construction.

B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL/CUL 705) for US and Canada. Fan shall bear the AMCA certified ratings seal for air performance.

C. Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The scroll wrapper shall be minimum 0.100" aluminum and the scroll side panels shall be minimum 0.100" aluminum. The entire fan housing shall be aluminum and spark-proof, shall have continuously welded seams for leak-proof operation. A performance cut-off shall be furnished to prevent the recirculation of air in the fan housing. The fan housing shall be field rotatable to any one of eight discharge positions and shall have a minimum 1-1/2-inch outlet discharge flange.

Bearing support shall be minimum 10-gauge welded steel. Side access inspection ports shall be provided with quick release latches for access to the motor compartment without removing the weather cover. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

D. Coating: Fan components shall have an electrostatically applied, baked polyester powder coating. Each powder coated component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000-hour salt spray under ASTM B117 test method.

E. Wheel: Wheel shall be aluminum centrifugal backward inclined, non-overloading flat blade type. Blades shall be continuously welded to the back plate and deep spun inlet shroud. Wheel hub shall be keyed and securely attached to the fan shaft. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

F. Motor: Provide explosion proof motor. Motor shall be NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase, and enclosure.

G. Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy duty re-greasable ball or roller type in a cast iron pillow block housing selected for a minimum L50 life in-excess of 200,000 hours at maximum cataloged operating speed.

H. Blower Shaft: Blower shaft shall be Type 316 Stainless Steel accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM.

I. Belts and Drives: Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

J. Provide utility set ventilator with explosion proof motor, spark proof housing and spark proof impeller wheel construction.

K. Provide with manufacturer’s aluminum inlet and outlet adapter.

L. Manufacturer: Subject to compliance with requirements, provide utility set ventilator of one of the following:
   1. Cook Co., Loren.
   2. Greenheck Fan Corp.
   3. Or approved equal.

2.04 GRAVITY VENTILATORS

A. General: Except as otherwise indicated, provide standard prefabricated gravity ventilator units of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation.

B. Hooded Gravity Ventilators: Provide gravity ventilators, hooded type, curb mounted, of size, type and capacity as scheduled, and as specified herein.
   1. Type: Stationary, natural draft type. Provide weatherproof housings to match power ventilators in materials and finish. Provide square or rectangular base to suit roof curb.
   2. Bird Screens: Provide removable bird screens, 1/2" mesh, 16-Ga. aluminum, or brass wire.
   3. Dampers: Provide gravity-actuated louvered dampers in curb bases.

4. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   a. Cook Co., Loren.
   b. Greenheck Fan Corp.
   c. Or approved equal.

2.05 PREFABRICATED ROOF CURBS

A. General: Provide manufacturer's standard shop-fabricated units, modified if necessary to comply with requirements.

B. Fabricate structural framing for units of structural quality, aluminum formed to profiles indicated or, if not indicated, to manufacturer's standard profiles for coordination with roofing, insulation, and deck construction.

C. Include 45-deg. cant strips and deck flanges with offsets to accommodate roof insulation. Weld corners and seams to form watertight units.

D. Reinforce continuous runs of over 3'-0" length by inserting welded stiffeners of heavy gage with flanges as required to provide sufficient rigidity and strength to withstand maximum lateral forces in addition to superimposed vertical loads.

E. Sloping Roof Decks: For deck slopes of 1/4" per foot and more, fabricate support units to form level top edge.

F. Gage and Height: Fabricate units of metal gage and to height above roof surface as indicated.
   1. Where gage or height is not indicated, fabricate units of 14-Ga. metal, and nominal height of 14" above roof surface.

G. Insulate units inside structural support wall with rigid glass fiber insulation board of approximately 3-Lb. density and 1-1/2" minimum thickness, except as otherwise indicated.

H. Provide support liners where shown.
   1. Use perforated metal for support liners, with approximately 1000, 3/32" diameter holes per Sq. Ft., to provide sound absorbing surfaces.
   2. Provide sound insulation insert for curbs so indicated. Construct of 1" thick rigid fiberglass panels secured in galvanized steel framework, with rounded edges to minimize airflow resistance.

I. Manufacturer: Subject to compliance with requirements, provide prefabricated roof curbs of the same manufacturer as ventilator.

PART 3 - EXECUTION

3.01 INSPECTION

A. General: Examine areas and conditions under which power and gravity ventilators are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF POWER AND GRAVITY VENTILATORS

A. General: Except as otherwise indicated or specified, install power ventilators in accordance with manufacturer's installation instructions and recognized industry practices to insure, that products serve the intended function.

B. Coordinate ventilator work with work of roofing, walls, and ceilings, as necessary for proper interfacing.

C. Ductwork: Refer to Division 23 Section "Metal Ductwork." Connect ducts to ventilators in accordance with manufacturer's installation instructions.

D. Roof Curbs: Furnish roof curbs to roofing Installer for installation.

E. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
   1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 Sections.

2. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

F. Remove shipping bolts and temporary supports within ventilators. Adjust dampers for free operation.

3.03 FIELD QUALITY CONTROL

A. Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of unit at performance requirements specified. When possible, field correct malfunctioning units, and then retest to demonstrate compliance. Replace units, which cannot be satisfactorily corrected.

3.04 ADJUSTING AND CLEANING

A. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.05 SPARE PARTS

A. General: Furnish to Owner, with receipt, one spare set of belts for each belt driven power ventilator.

END OF SECTION

SECTION 23 37 13
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Types of outlets and inlets required for project include the following:
   1. Linear slot diffusers and returns.
   2. Ceiling air diffusers, rectangular, square, round.
   3. Wall registers and grilles.

1.02 RELATED SECTIONS

A. Refer to other Division 23 Sections for ductwork and duct accessories required in conjunction with air outlets and inlets; not work of this section.

B. Refer to other Division 23 Sections for balancing of air outlets and inlets; not work of this section.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
   1. Schedule of air outlets and inlets indicating drawing designation, room location, quantity furnished, model number, size, and accessories furnished.
   2. Data sheet for each type of air outlet and inlet, and accessory furnished indicating construction, finish, and mounting details.
   3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature, and velocity traverses; throw and drop; and noise criteria ratings. Indicate selections on data.
   4. ANSI/ASHRAE Standard 70-1991.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

C. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 01.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver air outlets and inlets wrapped in factory-fabricated fiberboard type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors, when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

1.05 QUALITY ASSURANCE

A. Codes and Standards:
   1. ANSI/ASHRAE Compliance: Test and rate air outlets and inlets in certified laboratories under requirements of ANSI/ASHRAE Standard 70-1991.
   2. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.01 CEILING AIR DIFFUSERS

A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of ceiling air diffuser.

2.02 MANUFACTURER

A. Subject to compliance with requirement diffusers of one of the following:
   1. Krueger Mfg. Co.
   2. Titus Air Distribution Products
   3. Anemostat Air Distribution Products

B. Manufacturers and model numbers are listed and/or scheduled to set a standard of quality. Equivalent manufacturers and models accepted by Architect/Engineer may be used. Equivalents must be submitted for review.
   1. Equivalents: Other manufacturers offering a similar product which is in accordance with the design criteria indicated may be submitted upon architect’s written acceptance prior to bidding. The cost to conduct all tests as may be directed by the architect to demonstrate that the equivalent product can achieve the criteria indicated, including all travel costs, shall be borne by the submitting contractor.

2.03 LINEAR SLOT DIFFUSER AND RETURN

A. General: Provide acoustical ceiling air distribution system. Consisting of ceiling slot air diffusers, base-frames, air chambers and entry collars.

B. Air Distribution Base Frames:
   1. Linear air diffusers base frames shall mechanically lock into the grid system. The base frames shall be extruded aluminum sections. Length shall be 48" unless otherwise noted or required.
   2. Provide air distribution base frame with full supply air pattern control air weir gates. When used for return air, these air weir gates act as a return airflow control damper. Close air weir gates where return is not necessary.
   3. Base frame shall present a substantially uniform appearance through the air slot when used as supply, returns or fully closed. All interior portions of the throat, including the vertical stems of the extrusions, shall be painted flat black to prevent unsightly visual deviations. Paint all exposed surfaces baked white enamel. Base frame shall be compatible with type of ceiling where linear slot diffuser is installed.
   4. Base frame shall be provided with spacer channels located on the ceiling module. The spacer channel shall act as the support means for the adjustable full pattern control air weir gates, which are provided throughout the entire length of the base frame.
   5. The noise criteria of the air distribution base frame shall be expressed in sound power levels (decibels 10-12 Watts) in octave bands 2 through 7 with a room attenuation of 10 decibels and shall not exceed noise-criteria of 30. All data shall be based on tests performed in a certified laboratory.
   6. Where noted on drawings or as required, blank-off airtight backside of supply air linear slot where duct connection is not made.

C. Supply or Return Air Chambers:
   1. Supply or Return air plenum chambers shall be designed, tested, and fabricated by the same manufacturer that furnishes the base frames. Shop fabricated air chambers not acceptable. Provide with damper at inlet to plenum, which is accessible through face of linear diffuser for adjustment.
   2. Provide adjustable air pattern controllers that are accessible through the base frame slot for field adjustment of the spread of the air stream. This will be accomplished without the removal of acoustical tile.

3. Provide a round neck air entry collar sized for maximum average air entry velocity of 750 FPM. A volume damper shall be installed at connection to plenum, which is accessible through face of diffuser for adjustment.
4. Construct supply air chamber from not less than 26-gauge galvanized steel and will be lined with one- quarter inch 2 Lbs./Cu. Ft. density thermal acoustical insulating. All surfaces visible through the slot will be painted flat black.
5. Provide spring clip keepers to securely attach the chamber to the base frame when in operation. These spring clips permit releasing of the air chamber for easy relocation.
6. The supply air chamber shall have been tested as composite assembly with the linear base frame for air distribution and noise level performance. The tests shall be conducted in accordance with ANSI/ASHRAE Standard 70-1991.
7. For return air plenums above the ceiling, install Krueger Model DFRH plenum hood on all linear return air bars.

D. Manufacturer: Krueger Model DFL linear slot diffuser.

2.04 SIDEWALL SUPPLY AND RETURN REGISTERS AND GRILLES

A. Supply register - Krueger 1600 or as indicated elsewhere on contract documents.

B. Return register - Krueger S-5480 or as indicated elsewhere on contract documents.

C. Return grille - Krueger S-5480 or as indicated elsewhere on contract documents.

2.05 CONSTANT AIR VOLUME SYSTEM - CEILING DIFFUSERS (SUPPLY)

A. Concealed Spline - Krueger 5PLQ or as indicated elsewhere on contract documents.

B. Glued on Acoustile - Krueger 5PLQ or as indicated elsewhere on contract documents.

C. Plaster or Drywall - Krueger 5PLQ or as indicated elsewhere on contract documents.

D. 24" x 24" T-Bar - Krueger 5PLQ or as indicated elsewhere on contract documents.

Note: For 24" x 48" T-bar ceilings, coordinate with ceiling installer for auxiliary tees as required to create 24" x 24" space.

2.06 CONSTANT AIR VOLUME SYSTEM - CEILING RETURN, EXHAUST AND TRANSFER GRILLES AND REGISTERS

A. Registers shall be provided with opposed blade dampers.

B. Concealed Spline - Krueger EGC5 or EGC5-01 or as indicated elsewhere on contract documents.

C. Glued on Acoustile - Krueger EGC5 or EGC5-01 or as indicated elsewhere on contract documents.

D. Plaster or drywall - Krueger EGC5 or EGC5-01 or as indicated elsewhere on contract documents.

E. 24" x 24" T-bar - Krueger EGC5-F23 or EGC5-01-F23 or as indicated elsewhere on contract documents.

Note: For 24" x 48" T-bar ceilings, coordinate with ceiling installer for auxiliary tees as required to provide 24" x 24" space.

F. Transfer Grille - Ceiling - Same as return grilles.

2.07 VARIABLE AIR VOLUME SYSTEM - MODULAR CEILING DIFFUSERS (SUPPLY)

A. Krueger Model 1900SQ and shall have a frame style to interface with the ceiling grid system being used.

B. Manufactured from extruded aluminum. Provided with air pattern control weirs, and an integral deflection rail allowing for one- to four-way direction air flow producing uniform ceiling effect.

C. The air motion in the occupancy zone at maximum cubic feet per minute shall not exceed 50 feet per minute. Inner panel of matching acoustical tile shall provide an airtight joint.

D. Supply, Return and Exhaust Chambers:
   1. Designed and fabricated by the manufacturer of the base frames. Field fabricated chambers will not be accepted. Chamber to be supplied with spring clips to attach to the base frame. Constructed from not less than 26-gauge galvanized steel and lined with 1/4" 2 LBS/CU. FT. density thermal insulation. All surfaces visible through the air slot painted flat black.
   2. Chamber shall be supplied with a factory installed round entry collar for flex duct connection. Collar shall be sized for maximum average air entry velocity of 750 fpm. Chamber must be tested as a composite assembly with the base frame for air distribution and noise level performance by a certified testing laboratory. If used with side inlet, furnish and install vertical pressure equalizing baffle.

2.08 VARIABLE AIR VOLUME SYSTEM - MODULAR CEILING RETURN

A. Krueger Model 1900SQ Return diffuser.

B. Base frame from extruded aluminum. Frame shall have fixed weirs creating a continuous one-inch closed slot. Provide opposite blade volume damper.

2.09 VARIABLE AIR VOLUME SYSTEM - TRANSFER GRILLES

A. Krueger Model 1900SQ Return diffuser.

B. Base frame from extruded aluminum. Frame shall have fixed weirs creating a continuous one-inch closed slot. Provide opposite blade volume damper.

2.10 SUPPLY, RETURN AND EXHAUST CONNECTIONS TO METAL LINEAR CEILING

A. Air Factors sheet metal air boot (eight-slot for connecting to back of metal linear ceiling with slot openings with labyrinths, as applicable) for supply, return, and exhaust. Air boot shall lock onto back of ceiling system.

2.11 CIRCULAR CEILING DIFFUSERS

A. Krueger Model RA2 circular diffuser with adjustable inner cone.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to ensure that products serve intended function.

B. Provide 12” high plenum box with 1” acoustical insulation. Refer to installation detail on plans for additional requirements.

C. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

D. Coordinate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

E. Supply outlets to provide the required air throw and spread with no apparent drafts or excessive air movement within space being supplied. Contractor to provide necessary accessories to accomplish satisfactory air distribution.

F. Provide felt, cork or rubber gasket between finish-surface and frame to prevent vibration and assure tight fit. Contractor shall be responsible for the correct location of ductwork and outlets.

G. For filler panel type, outlets the manufacturer shall coordinate his design with the ceiling suspension system being used. The Contractor and manufacturer shall match up sizes of outlets to properly fit in ceiling systems, between concrete or masonry components, between architectural items before fabrication.

H. When installing removable core type outlets, secure to frame with screws.

I. Secure outlets to ceiling suspension systems as required by Division of the State Architect.

END OF SECTION

SECTION 23 81 19
PACKAGED ROOFTOP AIR CONDITIONER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section includes package rooftop heating and cooling units.

1.02 RELATED SECTIONS

A. Division 23
   1. Section "Common Motor Requirements for HVAC."
   2. Section "Facility Natural Gas Piping."
   3. Section "Metal Ductwork."
   4. Section "Testing, Adjusting, and Balancing."

B. Division 26
   1. Section "Electrical Connections for Equipment."

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities at scheduled conditions of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.

B. Shop Drawings:
   1. Submit shop drawings detailing the manufacturer's electrical requirements for power supply wiring for rooftop heating and cooling units. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
   2. Submit shop drawings detailing the mounting, securing, and flashing of the roof curb to the roof structure.
   3. Submit shop drawings detailing method of securing rooftop unit to roof curb to meet seismic restraint requirement.
   4. If an equal unit is being proposed to be used in lieu of the base specified unit, the contractor shall coordinate all differences as hereinafter described and note such differences on the shop drawings and incorporate all changes (if any) required by the structural and electrical engineers to accommodate the equal unit.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each rooftop unit, including "trouble-shooting" maintenance guide, servicing guide and preventative maintenance schedule land procedures. Include this data in maintenance manual in accordance with requirements of Division 01.

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. Gas-Fired furnace section construction shall be in accordance with AGA safety standards. Furnace section shall bear the AGA label.
   2. Testing and rating of rooftop units of 135,000 BTUH capacity or over shall be in accordance with ARI 360 "Standard for Commercial and Industrial Unitary Air-Conditioning Equipment".
   3. Testing and rating of rooftop units under 135,000 BTUH capacities shall be in accordance with ARI 210 "Standard for Unitary Air-Conditioning Equipment" and provide Certified Rating Seal. Sound testing and rating of units shall be in accordance with ARI 270 "Standard for Sound Rating of Outdoor Unitary Equipment". Units shall bear Certified Rating Seal.
   4. Refrigerating system construction of rooftop units shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
   5. Energy Efficiency Ratio (EER) or (SEER) of rooftop units shall be equal to or greater than prescribed by Title 24 - California Code of Regulations" (CCR) and as scheduled.

6. Rooftop units shall be designed, manufactured, and tested in accordance with UL requirements.
7. Rooftop units shall comply with SCAQMB Low NOx requirements

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle rooftop units and components carefully to prevent damage. Replace damaged rooftop units or components with new.

B. Store rooftop units and components in clean dry place, off the ground and protect from weather, water, and physical damage.

C. Rig rooftop units to comply with manufacturer's rigging and installation instructions for unloading rooftop units and moving them to final location.

1.06 SCHEDULING AND SEQUENCING

A. Coordinate installation of roof mounting curb with roof structure.

B. Coordinate roof-opening locations for mechanical and electrical connections.

1.07 SPECIAL WARRANTY

A. Warranty on Compressor (and Heat Exchanger): Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, compressors (and heat exchangers) with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only and does not include labor for removal and reinstallation.
   1. Warranty Period: 4-year extension from date of basic 1-year warranty, See Division 01.

1.08 MAINTENANCE

A. Extra Materials: Furnish to Owner, with receipt, the following spare parts for each rooftop heating and cooling unit:
   1. One set of matched fan belts for each belt-driven fan.

PART 2 - PRODUCTS

2.01 ROOFTOP UNITS (GENERAL)

A. General Description: Units shall be factory-assembled and tested, designed for roof or slab installation, and consisting of compressors, condensers, evaporator coils, heat exchanger, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers.

B. Units as manufactured by Carrier Corporation were used as the basis of design and their efficiencies are the bases of T-24 energy compliance calculation. Their capacities, weights and electrical characteristics are scheduled on the drawings. Units shall be designed for refrigerant R-410a.

2.02 ROOFTOP AIR CONDITIONING UNIT

A. Unit shall be of the single-package type, combination air-to-air cooling and gas-fired heating. Unit shall be AGA certified and meet requirements of CCR Title 24 and ASHRAE/IESNA 90.1.

B. Unit shall be ERR or SEER rated in accordance with ARI Standard 210-81 and California Administrative Title 24.

C. Compressor(s) - The unit shall contain (one or two) as scheduled, welded, fully hermetic scroll compressor(s) with suitable vibration isolators, overload protection, and crankcase heater and shall have a 5-year warranty.

D. Coils shall be constructed of aluminum fins mechanically bonded to copper tubes. Provide an independent expansion device for each refrigeration circuit. Factory pressure tested at 450 PSIG and leak tested at 200 PSIG. Evaporator coils shall be equipped with capillary restrictor. Condenser coils facing the exterior of the unit shall be equipped with screen protection grille.

E. Unit shall have the capability to remove the evaporative coil from top of unit.

F. Filter media shall provide at least a minimum efficiency reporting value of MERV 8.

G. Fans and motors - The evaporator air fan shall be of the forward-curved centrifugal type, direct-drive multi-speed or adjustable belt-driven as shown on the equipment schedule. Condenser fan motor shall have ball bearings. Sleeve type bearings are not acceptable. Condenser air fan shall be of the propeller type, directly driven and discharging upward.

H. Heat exchanger shall be tubular in design and constructed of 409 Stainless Steel heat exchanger corrosion-resistant aluminized steel. Heat exchanger shall carry a 15-year non-prorated warranty.

I. Refrigerant: R-410A.

J. Safety controls - Cooling section shall be protected by low pressure-stat, high pressure switch, compressor motor overloads, crankcase heaters, freeze-stat and lockout circuit that prevents compressor short cycling as a result of a rapid change in thermostat setting by automatically preventing compressor restart for at least 5 minutes.

K. Heating controls shall consist of a redundant gas valve, intermittent pilot ignition system, limit switches, centrifugal switch, and rollout switch. Heating section shall be designed for induced-draft combustion. Forced draft is not acceptable.

L. Roof Curb.
   1. General: Roof Curb shall be of down-shot arrangement and shall be of an approved manufacturer as indicated on the drawings and specification Section 23 05 48 and shall include an insulated panel under compressor section to prevent condensation forming on the bottom. Dimensions shall be provided to allow for each duct location and connection to roof curb prior to unit placement. Roof curb shall be a minimum of 14 in. high, except otherwise noted on drawings. Curb design shall comply with National Roofing Contractors Association requirements. Roof curb must be a manufactured pitched roof curb when applicable. If the manufacturer of the roof curb cannot provide a pitched roof curb due to the excessive slope of the roof, provide a structural leveling platform, then install a level roof curb. Coordinate this effort with work of all other trades involved.
   2. Isolation Roof Curb Type: Roof Curbs shall be of Prefabricated Isolation Curb type. Unit manufacturer shall furnish spring isolation curbs specifically designed for the air conditioning units. Isolation curb isolators must be pre-approved OSHPD. Pre-approval number must be included with the submittal. OSHPD approval Numbers must be included with the submittal. Numbers subject to approval will not constitute pre-approval. Springs must be a minimum of 2" deflection with seismic restraint. Curb shall have access doors for easy inspection and adjustment of each spring without dismantling any portion of the unit or curb assembly.
   3. Isolation curb must include a vandal-proof, galvanized steel counter-flashing skirt to assure long-term air and water seal integrity. Exposed rubber skirt seals are not acceptable. Curb and flashing shall be fully welded. Field assembled and bolted construction is not acceptable. Seismic attached (hold-down) clips with certified calculations by a registered California Structural Engineer shall be furnished with the isolation curb. Installation prior to submittal approval by Mechanical Engineer shall be subject to removal without any cost or obligation to the Owner. The contractor shall not install any unit without written approval.
   4. Roof curb must be a manufactured pitched roof curb when applicable. It the manufacturer of the roof curb cannot provide a pitched roof curb due to the excessive slope of the roof, provide a structural leveling platform, then install a level roof curb. Coordinate this effort with work of all other trades involved.
   5. Power Exhaust and Economizer: Power exhaust shall have a modulating centrifugal blower provided with variable frequency drive (VFD). Economizer control (Down-shot) shall include return air (R.A.) and outdoor air filter and hood, and fully modulating electric control system with O.A. thermostat and mixed air thermostat. Economizer control shall be capable of introducing up to 100% outdoor air. Power Exhaust shall be capable of relieving 100% of system air.

The control changeover from mechanical cooling to economizer operation shall be fully automatic through an adjustable integrated control sensing preassigned, outside-air requirements. Economizer shall be integrated type capable of simultaneous compressor and economizer operation for maximum benefit of outdoor air. Economizer shall utilize low leakage, opposing blade, gear driven dampers with UL approved gears. Provide economizer control for all units unless specifically indicated otherwise. Economizer shall incorporate a full-sized barometric relief that has the same face area as the outside air inlet. The relief shall be sized to relieve up to 100% relief air.

M. Thermostat assembly shall provide staged heating and cooling, manual and automatic changeover, fan control and integrated time delay protection.

N. Unit Casing
   1. Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating with removable access panels. Structural members shall be 18 gauge with access doors and removable panels of minimum 20 gauge.
   2. Cabinet Interior: Finish of interior surface in contact with the airstream shall comply with requirements of ASHRAE 62.1-2004.
   3. Unit cabinet's exterior surface shall be tested for 1000 hours salt spray test in compliance with ASTM B117.
   4. Cabinet construction shall allow for all service/maintenance from one side of unit.
   5. Cabinet top cover shall be one piece construction, or where seams exist it shall be double-hemmed and gasket-sealed.
   6. Access Panels: Water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.
   7. Unit Base Pan: Units base pan shall comply with ASHRAE 62.1-2004 requirements for drain pan construction and connections and shall have a raised 1-1/8-inch high lip, around the supply and return openings for water integrity.
   8. Insulation: Provide ½-inch thick fiberglass insulation with foil face on all exterior panels in contact with the return and conditioned air stream. All edges must be captured so that there is no insulation exposed in the air stream.
   9. Provide 115-Volt convenience outlet, factory-installed and unpowered, per NEC requirements.
   10. Provide openings either on side of unit or through the base for power, control, condensate, and gas connections as shown on contract document drawings.
   11. The base of the unit shall have 3 sides for forklift provisions. The base of the units shall have rigging/lifting holes for crane maneuvering.

2.03 MANUFACTURERS

A. Subject to compliance with the requirements project documents provide packaged rooftop air conditioning unit of one of the following manufacturers:
   1. Carrier Corporation (Basis of Design).
   2. Trane.
   3. York.

B. Carrier Corporation units are used as the basis of design and their efficiencies are the bases of energy calculations for Title-24 compliance. Contractor submitting units by other manufacturers named in this specification as alternate shall provide the required Title-24 calculations demonstrating compliance. This effort shall be at no cost to the owner, and all required calculations shall be submitted within 14 calendar days after the award of contract. Job will be awarded on basis of specified product. Alternates must comply with the performance and features as specified within these specifications and indicated on the design documents. Any, and all additional cost due to submission of alternate units for redesign and/or increase in construction cost of other trades and/or re-submittal fee to City authorities shall be bonded by the contractor.

2.04 CONTROLS

A. Control Module: Unit-mounted digital panel for interlock with the energy management system for heating, cooling, and fan operation. Include the following features (Refer to specification section 23 09 23 and construction document drawings for additional requirements):
   1. Low Ambient Lockout Control: Prevents cooling-cycle operation below 40 deg F. outdoor air temperature.
   2. Temperature-Limit Control: Prevents occupant from exceeding preset setup temperature.
   3. Building Automation System Interface: Allows remote on-off control with setback temperature control.

B. Remote Control: Standard unit-mounted controls with remote-mounted, low-voltage adjustable thermostat with heat anticipator, heat-off-cool-auto switch, and on-auto fan switch. (Refer to Division 25 and drawings for additional requirements).

2.05 CAPACITIES AND CHARACTERISTICS

A. Outdoor Air-Intake Rate: Unit outdoor air-intake rates shall be per equipment schedules on contract document drawings.

B. Cooling Capacity: Unit cooling capacities shall be per equipment schedules on contract document drawings.

C. Energy-Efficiency Ratio: Minimum unit Energy-Efficiency (EER) or Seasonal Energy Efficiency (SEER) Ratios shall be per equipment schedule on contract document drawings.

D. AFUE: Minimum unit AFUE shall be per equipment schedules on contract document drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which rooftop units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION

A. General: Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

B. Support: Install and secure roof curb to roof structure, in accordance with National Roofing Contractors Association (NRCA) installation recommendations and ship drawings. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing.

C. Provide substructure as required to set curbs plumb and level.

D. Electrical Connections: Refer to Section "Electrical Connections for Equipment" for final connections to equipment and installation of loose shipped electrical components.

E. Unit protection: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, or the period of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, provide temporary closure of duct openings and protection of mechanical equipment during construction.

F. All duct and other related air distribution component openings shall be covered with polyethylene film, tape, plastic, sheet metal or other methods acceptable to the enforcing agency which will prevent entrance of dust and debris.

3.03 DEMONSTRATION

A. Start-Up Services:
   1. Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Provide written start-up report for each unit.

B. Operating and Maintenance Training:
   1. Provide services of manufacturer's service representative to instruct Owner's personnel in operation and maintenance of rooftop units. Training shall include start-up and shutdown, servicing and preventative maintenance schedule and procedures, and trouble-shooting procedures plus procedures for obtaining repair parts and technical assistance. Review operating and maintenance data contained in the Operating and Maintenance Manuals specified in Division 01.

END OF SECTION

SECTION 23 81 26
SPLIT AIR CONDITIONING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Split DX cooling only and heat pump system with indoor split DX fan coil and outdoor cooling/condensing unit.

1.02 RELATED SECTIONS

A. Related sections include but are not limited to the following:
   1. Division 23
      a. Section "Common Work Results for HVAC"
      b. Section "Common Motor Requirements for HVAC Equipment"
      c. Section "Testing, Adjusting and Balancing"
      d. Section "Power and Gravity Ventilators"
   2. Division 26
      a. Section Electrical Connections for Equipment

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.

B. Shop Drawings:
   1. Submit shop drawings detailing the manufacturer's electrical requirements for power supply wiring for rooftop cooling/condensing and DX fan coil units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
   2. Submit shop drawings detailing the mounting, securing, and flashing of the outdoor unit to redwood sleepers and sleepers to the roof structure. Indicate coordinating requirements with roof membrane system.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each split cooling system, including "trouble-shooting" maintenance guide, servicing guide and preventative maintenance schedule and procedures. Include this data in maintenance manual in accordance with requirements of Division 01.

1.04 QUALITY ASSURANCE

A. Codes and Standards:
   1. Refrigerating system construction of split cooling system shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
   2. Seasonal Energy Efficiency Ratio (SEER) of split cooling system shall be equal to or greater than prescribed by Title 24 California Administrative Code "Building Energy Efficiency Standards".
   3. Split cooling system shall be designed, manufactured, and tested in accordance with UL requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Handle split cooling system and components carefully to prevent damage. Replace damaged rooftop units or components with new.

B. Store split cooling system and components in clean dry place, off the ground, and protect from weather, water, and physical damage.

C. Rig outdoor units to comply with manufacturer's rigging and installation instructions for unloading outdoor units and moving them to final location.

1.06 SCHEDULING AND SEQUENCING

A. Coordinate installation of outdoor unit redwood sleepers with roof structure.

B. Coordinate roof-opening locations for mechanical and electrical connections.

1.07 SPECIAL WARRANTY

A. Warranty on Compressor: Provide written warranty, agreeing to replace/repair, including all parts and labor within warranty period, compressors with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform a required provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period.

B. Warranty period shall be for a period of one year from the agreed start of the School District's beneficial use.

C. Extended warranty period. Provide written warranty signed by manufacturer, agreeing to replace components parts only, for an additional four (4) years for all hermetically sealed compressors.

1.08 MAINTENANCE

A. Extra Materials: Furnish to District, with receipt, the following spare parts for each split cooling system:
   1. One set of new filters for each unit set.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide product of one of the following manufacturers:
   1. Carrier Corp.
   2. Mitsubishi.
   3. Trane.

2.02 SPLIT COOLING SYSTEM (GENERAL)

A. Split cooling only and heat pump system shall be factory assembled and tested, consist of an indoor, wall mounted direct expansion fan coil unit and an outdoor roof mounted, air cooled unit with a hermetic compressor, an air-cooled coil, up-blast propeller type blow-through condenser fans, accumulator, holding refrigerant charge, and control box.

2.03 INDOOR UNIT

A. General: Indoor, direct-expansion, wall-mounted or ceiling-mounted fan coil. Unit shall be complete with coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, integral temperature sensing, and a holding charge of R-410A refrigerant. Unit shall be furnished with integral wall-mounting or ceiling-mounting bracket.

B. Unit Cabinet: Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene.

C. Fan: Shall be tangential blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic motor-driven horizontal air sweep shall be provided standard.

D. Coil: Shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins will be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate.

E. Motors: Shall be permanently lubricated with inherent overload protection. Fan motors shall be multi-speed.

F. Controls: Shall consist of a microprocessor-based control system that shall control space temperature, determine optimum fan speed, and run self-diagnostics. The unit shall have:
   1. An automatic restart after power failure at the same operating conditions as at failure.
   2. A timer-function to provide a minimum 15-hour timer cycle for system on or off.

3. Temperature-sensing controls and a high discharge temperature shut down.
4. Wired control or wireless infrared control to enter set points and operating controls (required accessory).
5. Filter status indication after 250 hours of indoor fan operation.
6. Test mode button to run self-diagnostics and aid in troubleshooting.

G. Filters: Unit shall have filter track with factory-supplied cleanable filter.

2.04 OUTDOOR UNIT

A. General: Factory assembled, single piece, air-cooled outdoor unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, and holding charge of R-410A refrigerant.

B. Unit Cabinet:
1. Unit cabinet shall be constructed of galvanized steel, bonderized, and coated with a baked enamel finish.
2. Unit access panels shall be removable with minimal screws and shall provide full access to the compressor, fan, and control components.
3. Compressor compartment shall be isolated and have an acoustic lining to assure quiet operation.

C. Fans:
1. Condenser fans shall be direct-drive propeller type, discharging air horizontally, and blowing air through the condenser coil.
2. Condenser fan motors shall be totally enclosed, single-phase motors with class B insulation and permanently lubricated ball bearings. Motor shall be protected by internal thermal overload protection.
3. Shaft shall have inherent corrosion resistance.
4. Fan blades shall be corrosion resistant and shall be statically and dynamically balanced.
5. Condenser fan openings shall be equipped with PVC grille cover and screen protection grille.

D. Compressor:
1. Compressor shall be fully hermetic reciprocating or scroll type.
2. Compressor shall be equipped with oil system, operating oil charge, and motor. Internal overloads shall protect the compressor from over temperature and current. Scroll compressors shall also have high discharge gas temperature protection.
3. Motor shall be NEMA rated class F, suitable for operation in a refrigerant atmosphere. Reciprocating compressors shall be equipped with crankcase heaters to minimize liquid refrigeration accumulation in compressor during shut down and to prevent refrigerant dilution of oil.
4. Compressor assembly shall be installed on rubber vibration isolators and shall have internal spring isolation.

E. Condenser Coil: Shall be constructed of aluminum fins mechanically bonded to internally enhanced, seamless copper tubes that are cleaned, dehydrated, and sealed.

F. Refrigeration Components: Refrigerant circuit components shall include external liquid line service valve with service port, suction line service valve with service gage connection port, service port connections on compressor suction and discharge lines with Schrader-type fittings, 4-way valve on heat pumps, accumulator, filter drier, pressure relief, and a holding charge of refrigerant.

G. Controls and Safeties: Operating controls and safeties shall be factory selected, assembled, and tested. The minimum control function shall include:
1. Controls:
a. Time delay restart to prevent compressor short cycling.
b. Automatic restart on power failure.
c. Three-pole contactors on 3-phase units.

d. Safety lockout.
e. High, and low-pressure switches.
f. Automatic fan motor protection.
g. Start capacitor and relay only on single-phase units.
h. When heat pump units are matched with high wall and ceiling suspended units, defrost control shall be based on demand determined by the outdoor air temperature and the coil temperature.

2. Safeties:
a. High temperature protection.
b. System diagnostics.
c. Compressor motor current and temperature overload protection.
d. High-pressure relief.
e. Condenser fan failure protection.

H. Electrical Requirements:
1. Unit electrical power shall be a single point connection.
2. Unit control voltage to the indoor fan coil shall be 24V.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which split cooling system is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION

A. General: Install split cooling system in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

B. Support: Install and secure redwood sleepers to roof structure, in accordance with National Roofing Contractors Association (NRCA) installation recommendations and shop drawings.

C. Electrical Connections: Refer to Division 26 Electrical Connections for Equipment for final connections to equipment and installation of loose-shipped electrical components.

3.03 DEMONSTRATION

A. Provide the services of a qualified service representative to start-up split cooling system in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

END OF SECTION

SECTION 23 82 00

SEQUENCE OF OPERATION

PART 1 - GENERAL

1.01 ROOFTOP UNITS (AC-1 THROUGH AC-7)

A. Indoor Fan: During Occupied periods, fan shall operate continuously. During Unoccupied periods, fan shall operate when the space temperature exceeds the unoccupied heating or cooling set-points. The fan operates at single speed and provides on/off operation.

B. Heating Mode: When space temperature is below the occupied heating set-point, unit shall operate in the heating mode. Unit shall stage available heat stages to satisfy demand in the occupied space.

C. Cooling Mode: When space temperature is above occupied cooling set-point, unit shall operate in the cooling mode. Unit shall enable available cooling stages to satisfy demand in the occupied space. Outside air shall be used as the first stage of cooling based on Economizer operation.

D. Economizer: Economizer dampers shall close when fan is off or during a loss of power. During occupied hours, when fan is energized, the economizer shall open to adjustable minimum position equal to provide the minimum outside air value shown on the equipment schedule or per requirements of the occupied space CO2 sensor. When outside air temperature is 5 ° F below space temperature set-point and occupied space requires cooling, economizer shall open to 100% and provide 100% outside air as the first stage of cooling. When economizer air is not sufficient to meet the occupied space cooling demand, economizer shall close to provide only the minimum outside air required per equipment schedule or per requirements of the occupied space CO2 sensor and then unit shall enable available cooling stages to satisfy demand in the occupied space.

E. Co2 Control: Unit shall monitor space CO2 during when the supply fan is energized. When CO2 is above set-point, economizer shall modulate open toward an adjustable maximum CO2 position.

F. Power Exhaust: The exhaust fan shall operate based on the occupied space pressure sensors and shall modulate to maintain the room pressure set-point of no more than 5 pounds of force and as determined by Air Balancer. Not controlled through EMS.

G. Filter Status**:** When the pressure across the filter bank exceeds the set-point of the differential pressure switch, an alarm indicates a dirty filter.

H. **INTERLOCK SCHEDULE FOR EXHUAST FANS EF-1 THRU EF-6**

Sequence Of Operation For EF-1 thru EF-6		
EF Unit	Interlock	Area Served
EF-1	Space Lighting	Women’s Restroom # 117
EF-2	Space Lighting	Men’s Restroom # 119
EF-3	Wall Switch	Concession # 101
EF-4	Space Lighting	Women’s Restroom # 109
EF-5	Space Lighting	Men’s Restroom #108
EF-6	Line Voltage Thermostat	Storage # 116
EF-7	AC-7	Weight Room 126

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 26 01 00-GENERAL ELECTRICAL SPECIFICATIONS

1.1 WORK INCLUDED:

A. This specification shall apply to all phases of Work hereinafter specified, shown on Drawings, or as required to provide a complete installation of electrical systems for this Project. Work required under this specification, is not limited to just the Electrical Drawings - refer to Architectural, Structural, Landscape, and Mechanical / Plumbing Drawings, as well as all other drawings applicable to this project, which designate the scope of work to be accomplished. The intent of the Drawings and Specifications is to provide a complete and operable electrical system that includes all documents that are a part of the Contract.

1. Work Included. Furnish labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on Drawings, and its delivery to the Owner complete in all respects ready for use.

2. The electrical Work includes installation or connection of certain materials and equipment furnished by others. Verify installation details, installation and rough-in locations from the actual equipment or from the equipment shop drawings.

B. Electrical Drawings. Electrical Drawings are diagrammatic, and are intended to convey the scope of work, indicating intended general arrangement of equipment, conduit and outlets. Follow Drawings in laying out Work and verify spaces for installation of materials and equipment based on actual dimensions of equipment furnished.

1.2 QUALITY ASSURANCE

A. Design, manufacture, testing and method of installation of all apparatus and materials furnished under requirements of these specifications shall conform to latest publications or standard rules of the following:

- Institute of Electrical and Electronic Engineers - IEEE
- National Electrical Manufacturers' Association - NEMA
- Underwriters' Laboratories, Inc. - UL
- National Fire Protection Association - NFPA
- Federal Specifications - Fed. Spec.
- American Society for Testing and Materials - ASTM
- American National Standards Institute - ANSI
- National Electrical Code - NEC
- National Electrical Safety Code - NESC
- Insulated Cable Engineers Association - ICEA
- American Institute of Steel Construction - AISC
- State and Municipal Codes In Force In The Specific Project Area
- Occupational Safety and Health Administration (OSHA)
- Electronics Industries Association/ Telecommunications Industry Association (EIA/TIA)
- California Electrical Code (where adopted)
- Local Authority Having Jurisdiction (AHJ) Published Electrical Standards and Codes

B. Perform Work in accordance with the National Electrical Code, applicable building ordinances, and other applicable codes, hereinafter referred to as the "Code." The Contractor shall comply with the Code including local amendments and interpretations without added cost to the Owner. Where Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply

unless variance is approved.

1. Comply with all requirements for permits, licenses, fees and codes. The Contractor, at Contractor's expense, shall obtain all permits, licenses, fees, special service costs, inspections and arrangements required for Work under this contract, unless otherwise specified.

2. Comply with requirements of the applicable utility companies serving this Project. Make all arrangements with utility companies for proper coordination of Work.

1.3 GENERAL REQUIREMENTS

A. Guarantee: Furnish a written guarantee for a period of one (1) year from date of acceptance.

B. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to ensure complete and operable systems as required by the Owner and Engineer.

C. All Core Cutting, Drilling, and Patching:

1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.

2. No holes will be allowed in any structural members without the written approval of the Project's Structural Engineer.

3. For penetrations of concrete slabs or concrete footings, the work shall be as directed in the Concrete Section of Specifications.

4. The Contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.

5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.

D. Verifying Drawings and Job Conditions:

1. This Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.

2. This Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment(s) shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

1.4 WORK IN COOPERATION WITH OTHER TRADES

A. Examine the Drawings and Specifications and determine the work to be performed by the electrical, mechanical and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment.

B. Provide a conduit only system for low voltage wiring required for control of mechanical and plumbing equipment described in this or other parts of the Contract Documents. Install all control housings, conduits and backboxes required for installing conductors and wire to the controls.

C. Install separate conduits between each heating, ventilating and air conditioning sensing device and its control panel and/or control motor. Before installing any conduit for heating, ventilating and air conditioning control wiring, verify the exact requirements from the control diagrams provided with the equipment manufacturer's shop drawings.

1.5 TESTING AND ADJUSTMENT

A. Upon completion of all electrical work, this Contractor shall test all circuits, switches, light fixtures, lighting control & dimming systems including distributed systems, motors, circuit breakers, motor starters and their auxiliary circuits and any other electrical items to ensure perfect operation of all electrical equipment.

B. Equipment and parts in need of correction and discovered during such testing, shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.

C. All circuit(s) shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.

D. All test reports, including copies of any required Energy Code Acceptance Forms (e.g. CA Title 24 Acceptance for Code Compliance Forms) should be submitted to the Engineer at completion of project.

1.6 IDENTIFICATION

A. Nameplates shall be provided for unit substations, switchgear, switchboards, distribution boards, distribution panels, panel boards, motor control centers, transformers, transfer switches, contactors, starters, disconnect switches, enclosed circuit breakers/switches, Inverters, UPSs, PDUs, RDCs, Lighting Control Panels, Dimming Panels, Door Releasing System Panels, Fire Alarm / Central Monitoring terminal cabinets/power supplies/control panels, and all low voltage system terminal & control cabinets. Nameplate inscriptions shall be identical to the equipment designations indicated in plans and specifications.

All circuit breakers/fuses in switchgear, switchboards, distribution boards, distribution panels, UPS output circuit breakers, PDU output circuit breakers and motor control centers shall have individual nameplates located immediately adjacent to the respective device. Nameplate inscription shall identify the downstream equipment or device served by the circuit breaker or fuse.

Nameplates for contactors, starters, disconnect switches, and enclosed circuit breakers shall be engraved with the device designation/identification on the top line, source identification for the device on the 2nd line and load designation for the device on the bottom line. Where device designation is not indicated on plans/specifications, Contractor shall submit a written clarification request to the Engineer.

B. Identification nameplates, UON, shall be laminated 1/8" thick micarta with beveled edges and engraved white letters 3/8" high, minimum, on 1-1/2" high black background for single line of text. Where two lines of text are required, provide min. 2" high nameplate. Where three lines

of text are required, provide min. 2.5" high nameplate.

C. Identification nameplates for new switchgear, switchboards, distribution boards, distribution panels, panel boards & motor control centers shall be attached with switchgear manufacturer-provided screws via switchgear manufacturer factory pre-drilled holes. A factory option to rivet identification nameplates to the equipment is only acceptable if screw-fastened nameplates are not an available option from the switchgear manufacturer. Field drilling or other mechanical attachment methods that change/void the NEMA or NTRL rating of the enclosure are strictly forbidden.

D. Identification nameplates for transformers, transfer switches, disconnect switches, enclosed circuit breakers/switches, Inverters, UPSs, PDUs, RDCs, Lighting Control Panels, Dimming Panels, Door Releasing System Panels, Terminal cabinets and all circuit breakers/fuses in switchgear, switchboards, distribution boards, distribution panels, UPS output circuit breakers, PDUs, PDU output circuit breakers, and motor control centers shall be attached to the equipment by self-adhesive backing integral to the nameplates. When equipment is located outdoors, provide nameplates without self-adhesive backing and attach to equipment using weather-rated, UV- resistant epoxy. In all cases, clean surfaces before applying identification nameplates parallel to equipment lines.

E. Warning Placards, as required by General Single Line Diagram Notes for multiple power sources, or Instruction Placards, as required for all kirk-key interlock schemes, all UPS bypass procedures or as required elsewhere in the plans/specifications shall be self-adhesive, 1/8" thick micarta with beveled edges, engraved 1/2" high white lettering on a Red background. Warning/Instruction Placards shall be attached to the face of the equipment directly related to the placards. Provide a formal placard submittal for review by the Engineer prior to ordering any Warning/Instruction Placards. In all cases, clean surfaces before applying Warning/Instruction Placards parallel to equipment lines.

F. Receptacles that are part of a UL-listed under floor computer room whip assembly, ceiling and/or cable/ladder tray-mounted receptacles used in lab, manufacturing, commercial kitchen environments or that are serving telcom/data/av racks & cabinets shall have identification nameplates located on the wiring device plate cover. Nameplates shall be self-adhesive, 1/8" thick micarta with beveled edges, engraved 1/4" high white lettering on black background with serving power source, circuit identification and NEMA/IEC receptacle type. Use of two (2) separate nameplates per device plate cover is acceptable. Affix nameplates to be visible when plugs are occupying receptacles.

G. See wiring device section of this specification for additional wiring device plate cover labeling requirements.

H. See drawings for panel board schedule directory installation requirements.

I. See conduit installation section of this specification for conduit labeling requirements.

1.7 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the Specifications and/or the Drawings have been fully completed, representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

1.8 RECORD DRAWINGS

A. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of drawings. These shall be corrected daily and show every change from the original Drawings. This set of prints shall be kept on the job site and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case. Upon completion of the work, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

1.9 APPROVALS, EQUALS, SUBSTITUTIONS, ALTERNATIVES, NO KNOWN EQUAL

A. Approvals: Where the words (or similar terms) "approved", "approval", "acceptable", and "acceptance" are used, it shall be understood that acceptance by the Owner, Architect and Engineer are required.

B. Equal: Where the words (or similar terms) "equal", "approved equal", "equal to", "or equal by", "or equal" and "equivalent" are used, it shall be understood that these words are followed by the expression "in the opinion of the Owner, Architect, and Engineer". For the purposes of specifying products, the above words shall indicate the same size, made of the same construction materials, manufactured with equivalent life expectancy, having the same aesthetic appearance / style (includes craftsmanship, physical attributes, color and finish), and the same performance.

C. Substitution: For the purposes of specifying products "substitution" shall refer to the submittal of a product not explicitly approved by the construction documents / specifications.

1. Substitutions of specified equipment shall be submitted and received by the Engineer ten (10) days prior to the bid date for review and written approval. Regulatory Agency approval for all substitutions will be the sole responsibility of the Contractor. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letterform and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples, if requested, must be included in the submittal. ONLY PRE-BID APPROVED PRODUCTS, ISSUED VIA A FORMAL BID ADDENDUM TO ALL BIDDERS, WILL BE ALLOWED ON THE PROJECT. REGARDLESS OF THE APPROVAL ON ANY SUBSTITUTION, ALL BIDS SHALL BE BASED ON THE PRODUCTS EXACTLY AS SPECIFIED. PRICING FOR EACH APPROVED SUBSTITUTION SHALL BE INCLUDED IN THE BID SUBMITTAL AS A SEPARATE LINE ITEM.

2. In the event that written authorization is given for a substitution, after award of contract, the Contractor shall submit to the Engineer quotations from suppliers / distributors of both the specified and proposed equal material for price comparison, as well as a verification of delivery dates that conform to the project schedule.

3. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.

4. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.

D. Alternates \ Alternatives: For the purposes of specifying products, "alternatives / alternates" may be established to enable the Owner / Architect / Engineer to compare costs where alternative materials or methods might be used. An alternate price shall be submitted in addition to the base bid for consideration. If the alternate is deemed acceptable, written authorization will be issued.

E. No Known Equal: For the purposes of specifying products, "No Known Equal" shall mean that the Owner / Architect / Engineer is not aware of an equivalent product. The Contractor will need to submit a "Substitution" item, per the requirements listed above, if a different product is proposed to be utilized.

1.10 SHOP DRAWINGS / SUBMITTALS

A. Shop Drawings / Submittals shall be submitted in six (6) bound sets accompanied by Letter of Transmittal, which shall give a list of the number and dates of the drawings submitted. Drawings shall be complete in every respect and bound in sets.

B. The Shop Drawings / Submittals submitted shall be marked with the name of the project, numbered consecutively and bear the approval of the Contractor as evidence that the Contractor has checked the Drawings. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.

C. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in the Contractor's letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment that may be caused by the substitution. Samples shall be submitted when requested.

D. Only products listed as "Equal" within the contract documents, along with formally approved "Substitutions" will be reviewed. Products not conforming to these items will not be reviewed and will be returned to the Contractor for re-submittal.

E. Review comments used in response to shop drawings / submittals are:

• "No Exception Taken"	Product approved as submitted.
• "Furnish As Corrected"	Re-submittal not required, although the Contractor shall provide the submitted product with corrections as noted.
• "Revise And Resubmit"	Re-submittal required with corrections as noted.
• "Rejected"	Re-submittal required based upon the originally specified product.

F. Shop drawings shall be submitted on the following but not limited to:

- Lighting Fixtures, Lamps and Ballasts.
- Switchgear, Switchboards, Distribution Boards, Motor Control Centers, Panel boards, and Bus Ducts; complete with overcurrent device information.
- Transformers.
- Fire alarm System/Central Monitoring System.
- Wiring Devices.
- Lighting Control System / Dimming System Products.
- Pullboxes and Underground Vaults

- Terminal Cabinets
- Lighting Inverters, UPSs, RDCs, PDUs, Generators, Transfer Switches, TVSS Systems
- Cable Tray, Flexible Cable tray and Cable Runway
- Power Poles and Floor Boxes
- Arc Flash, Short-Circuit & Coordination studies
- All other products called out on drawings that call for shop drawing submittal.

1.11 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRING DIAGRAMS

A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating and maintenance and servicing instructions, as well as four (4) complete wiring diagrams for the following items or equipment:

- Lighting Control System / Dimming Systems.
- Fire alarm system.
- Transformers.
- Switchgear, Switchboards, Distribution Boards, Motor Control Centers, Panel boards, and Bus Ducts; complete with over current device information.
- Lighting Inverters, UPSs, PDUs, Generators, Transfer Switches, TVSS Systems

B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Four (4) copies shall be presented to the Owner.

1.12 INTERRUPTION OF SERVICE OR SERVICE SHUTDOWN:

A. Any interruption of electrical services, electrical circuits, electrical feeders, signal systems, communication systems, fire alarm systems, etc. required to perform work shall meet the specific prior-approval requirements of the Owner. Such work shall be scheduled with the Owner to be performed at the Owner's convenience.

B. Interruptions/outages of any of the Owner’s systems and services mentioned above shall be scheduled to occur during other than the Owner’s normal business hours. Any overtime costs shall be borne by the Contractor.

C. See drawings for any additional requirements regarding outages, interruption and any temporary services required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and Equipment: All electrical materials and equipment, including custom-made equipment, shall be new and shall be listed by Underwriter's Laboratories (UL) and bear their label or be listed and certified by a Nationally Recognized Testing Lab (NTRL) that is also recognized by the local Authority-Having-Jurisdiction (AHJ).

B. Switchgear /Switchboards / Distribution Boards / Motor Control Centers:

1. See general single line notes on single line drawing for more information.

C. Panel boards - Branch Circuit:

1. See drawings for requirements and panel board schedules; and Specification Section 26

24 16 for additional requirements.

D. Lighting Fixtures:

1. See drawings for lighting fixture and lamp schedules and additional specifications. Furnish, install and connect a lighting fixture at each outlet where a lighting fixture type symbol (designated on plans) is shown as being installed. Each fixture shall be complete with all required accessories including sockets, glassware, boxes, spacers, mounting devices, fire rating enclosure and lamps.

2. LED Drivers: See lighting fixture schedule notes. All noisy driver shall be replaced at no cost to the Owner.

3. Lamps: See lamp / fixture schedule and lamp / lighting fixture schedule notes.

E. Wiring Devices:

1. Provide wiring devices indicated per plan. Devices shall be specification grade. Acceptable manufactures are Leviton, Arrow-Hart and Hubbell. Provide all similar devices of same manufacturer, unless indicated otherwise. All device colors shall be from the full range of manufacturer standard color options as selected by the Architect. This selection will be made during the shop drawing review process

2. Receptacles:

a. Duplex receptacles shall be specification grade, 20 amperes, 125 volts, 3 wire, side wired with binding screws, parallel slots, U-ground, plaster ears and captive mounting screws. Body shall be phenolic, plastic or bakelite. Receptacles shall be heavy duty, 3-blade current carrying contacts and double wide flat blade ground contacts. Receptacles shall be Arrow-Hart 5242-I, Hubbell 5242-I or Leviton 5242-I or approved equal.

b. Single receptacles shall be specification grade, grounding type, side wired, with binding screws, receptacles shall have standard size ivory bakelite base. For circuits consisting of one single receptacle only, ampere rating of receptacle shall be the same as circuit breaker or fuse. 20 ampere, 125 volt receptacles shall be NEMA 5-20R, Arrow-Hart 5721-I.

c. Kiln receptacles and range receptacles shall be 3-pads, 4-wire, grounding type, rated 50 amperes at 125/250 volts, polarized, Arrow-Hart #5754, and shall be provided with a 2-gang, stainless steel plate, Arrow-Hart #9336.

d. Dryer receptacles shall be 3-wire, non-grounding type, rated 30 amperes at 125/250 volts, polarized, with "L" shaped and angled straight contacts and ivory bakelite baselite base, Arrow-Hart #9344N with a 2-gang stainless steel plate Arrow-Hart S703.

e. Ground fault interrupter type receptacles shall consist of a single receptacle and reset device manufactured in a standard configuration for use with a duplex plate. Receptacles shall be feed-thru, 20 ampere, NEMA 5-20R, ivory in color and shall be Leviton 6399-I, or equal. Exterior mounted receptacles shall be weatherproof.

f. Tamper resistant receptacles shall be 20 amp, 125 volts, Hubbell Cat. No.

HBLSG62HI, Nema 5-20R.

F. Switches:

1. Local Switches:

a. Local switches shall be tumbler type, specification grade, rated 20 amperes at 120-277 volts AC only, with plaster ears, binding screws for side wiring, and standard size composition cups which fully enclose the mechanism. Switches shall be approved for use at currents up to the full rating on resistive, inductive, tungsten filament lamp and fluorescent lamp loads, and for up to 80% of the rating for motor loads. Switches shall be single pole, double pole, 3-way, 4-way, non-lock type. Non-lock type switches shall have ivory handles, and switch shall be Hubbell HBL 1221-I single pole, HBL 1222-I double pole, HBL 1223-I 3-way, and HBL 1224-I 4-way.

b. All lock type switches shall have metal or nylon key guides with ON/OFF indication, and shall be operable by the same key. Key switches shall be Hubbell1209

c. Rotary lock switches shall incorporate a tumbler type lock to prevent unauthorized operation. Lock shall be tumbler type by P & F Corbin, keyed to a HH41 key. Lock switch shall be installed with pin tumblers facing downward. Key shall be removable in all positions. Each device shall be complete with 2 keys. Keys shall be delivered only to the District's Electrical Inspector. Switches shall be rated at 20 amperes, 120-277 volt AC. Switches shall be as follows: single pole switches shall be Arrow-Hart 1191; double pole switches shall be Arrow-Hart 1192; 3-way switches shall be Arrow-Hart 1193. Switch plates shall be of stainless steel, engraved with "ON" and "OFF" positions. Switch plates shall be Arrow-Hart 1187. For switch plates of 2 or more gangs, provide special order plates equal to the single gang plate.

d. Pilot light switches shall be rated 20 amps and shall conform to the specifications for "local switches". The switches shall have red, rugged "Lexan" handles that are lighted by long-lasting neon lamps. Pilot light shall light when load is on. Single pole, 120 volt switches shall be Hubbell HBL1221-PL. Single pole, 277 volt switches shall be Hubbell HBL1221-PL7.

e. Remote control switches for mechanically held contactors arranged for 3-wire control shall be tumbler type, momentary contact, single pole, 3-position with center "OFF", rated 20 amperes at 120-277 volts AC only, with plaster ears, binding screws for side wiring, standard size composition cups which fully enclose mechanism, and ivory handles; Hubbell HBL1556-I.

2. The following device plates shall be engraved:

a. Key operated switches, switches with Pilot Lights and Switches for the control of motors, heaters and ventilators. Engraving shall be black and occur on the exposed side of the plate and indicate the motor, heater, or ventilator controlled.

b. Receptacles on generator and/or UPS power shall have custom stamped plates with the words “Generator” or “UPS” in black letters.

3. Weatherproof Outlet Covers/Assemblies. All Receptacles identified as weatherproof on the drawings shall be GFCI type and equipped as follows:

   a. Subscript WP-A: Recessed wall box, 6″ x 6″x 5 ½″ deep, with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door that is wet location-listed raintight while-in-use. Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). C.W. Cole TL-310-9-GFI-PH-MOD-CUSTOM COLOR Series with an interior metal plate suitable for a GFCI receptacle in one compartment separated from a second compartment with a metal separation barrier. The second compartment shall have a blank metal plate suitable for field installation of power, AV or communications devices. This compartment shall have a minimum ¾″ C.O. with pull string routed from the box to the facility telephone backboard unless otherwise noted on the drawings. Provide 1 key minimum per device to the Owner's project manager upon completion of project. Include all costs for custom color powder coat finish as selected by Architect.

   b. Subscript WP-B: Wet location-listed raintight while-in-use cast copper-free aluminum lockable cover with baked aluminum lacquer finish and one gang GFCI receptacle. Hubbell WP26M series. Polycarbonate covers are unacceptable. Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). Contractor shall field paint custom color as selected by Architect.

   c. Subscript WP- C: Single Service BK Lighting #CUS-1204-46 raintight while-in-use cast copper-free aluminum lockable cover with baked aluminum lacquer finish and one-gang GFCI receptacle. Hubbell WP26M series or equal. Polycarbonate covers are unacceptable. Wet location-listed weatherproof cover shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). Contractor shall provide custom color by manufacturer as selected by Architect. See drawings for additional details.

   d. Subscript WP-D: Dual Service BK Lighting #CUS-1204-47 with raintight while-in-use cast copper-free aluminum lockable cover(s) with baked aluminum lacquer finish, internal barrier, one gang GFCI receptacle and one gang telecommunications outlet. Hubbell WP26M series. Polycarbonate covers are unacceptable. Wet location-listed weatherproof cover(s) shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). Contractor shall provide custom color by manufacturer as selected by Architect. See drawings for additional details.

G. Motor Controllers / Starters: See drawings for motorized equipment schedules and specifications.

H. Circuit Breakers:

1. Service entrance circuit breakers smaller than 400 Amp frame shall be thermal-magnetic trip with inverse time current characteristics unless otherwise indicated below. Service entrance main circuit breakers, 400 Amp frame and larger shall be 100% rated, solid-state type as outlined in this specification. All other service entrance circuit breakers, 400 Amp frame and larger, shall be 100% rated, solid-state type as outlined in this specification.

2. All non-service entrance circuit breakers 225 Amp and larger shall be thermal magnetic

type and have continuously adjustable magnetic pick-ups of approximately 5 to 10 times trip rating. Breakers shall have easily changed trip rating plugs with trip ratings as indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Additionally, all non-service entrance circuit breakers, 600 Amp frame and larger, located in 480v 3 phase, 3-wire or 277/480v, 3 phase 4-wire switchgear, distribution boards or panel boards, shall be solid state, 100% rated. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120-volt operated test kit. Contractor shall utilize a test kit capable of testing all breakers 400 Amp and above - at the Engineer's request.

3. All non-service entrance circuit breakers less than 225 Amp shall be molded plastic case, air circuit breakers conforming to UL 489. Provide breakers with thermal magnetic trip units, and a common trip bar for two- or three-pole breakers, connected internally to each pole so tripping of one pole will automatically trip all poles of each breaker. Provide breakers of trip-free and trip-indicating bolt-on type, with quick-make, quick-break contacts. Provide single two- or three-pole breaker interchangeability. Provide padlocking device for circuit breakers as shown on the Drawings.

4. Where a Current Limiting Circuit Breaker (CLCB) is indicated on drawings or as required elsewhere in this specification, provide a U.L. listed current limiting thermal magnetic circuit breaker(s) u.o.n. An independently operating limiter section within a molded case is not allowed. Coordinate CLCB ratings as required to protect electrical system components on the load side of the CLCB to include, but not limited to, protecting automatic transfer switches, panel boards and lighting control panels.

5. Where a solid-state circuit breaker is indicated on drawings or as required elsewhere in this specification, provide a solid-state circuit breaker with minimum five function complete with built-in current transformers. The five functions shall be independently adjustable and consist of Overload/Long Time Amp Rating, Long Time Delay, Short Time Delay, Short Circuit/Instantaneous Pickup, but may also include Shunt Trip and/or Ground Fault if so indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120-volt operated test kit. Contractor shall utilize a test kit capable of testing all breakers 400 Amp and above - at the Engineer's request.

6. Ground Fault Interrupting Breakers. Provide with molded plastic case, air circuit breakers, similar to above with ground fault circuit interrupt capability, conforming to UL Class A, Group 1.

7. Arc Fault Interrupting Breakers. Provide with molded plastic case, air circuit breakers, similar to above with arc fault circuit interrupt capability, conforming to UL 1699 & UL Class A, Group 1. Provide on all-dwelling unit circuits supplying bedrooms, sleeping quarters etc as required to comply with NEC, or CEC where adopted, Article 210.12(B).

8. Tandem or half-sized circuit breakers are not permitted.

9. Series Rated Breakers. UL listed series rated combinations of breakers can be used to obtain panelboard-interrupting ratings shown on Drawings. If series rated breakers are used, switchboards, distribution boards and panel boards shall be appropriately labeled to indicate the use of series rated breakers. Shop drawing submittal shall

include chart of U.L. listed devices, which coordinate to provide series rating.

10. Circuit breakers shall be standard interrupting construction. Panelboard shall accept standard circuit breakers up to 225 amperes.

11. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.

12. Shunt trip equipped circuit breakers shall be provided on all elevator feeders.

13. Temperature compensating circuit breaker(s) shall be provided when located in outdoor enclosure(s) or when located in an enclosure subject to high ambient heat due to nearby industrial processes etc.

14. Provide 75 degree Celsius-rated conductor lugs/lug kits as required on all circuit breakers to accept conductor quantities and sizes shown on drawings.

15. All circuit breaker terminations shall be suitable for use with 75 degrees Celsius ampacity conductors.

I. Disconnect Switches:

1. Non-fusible or fusible, heavy-duty, externally operated horsepower-rated, 600V A.C. Provide NEMA 3R, lockable enclosures for all switches located on rooftops, in wet or damp areas and in any area exposed to the elements.

2. Fusible switches shall be Class "R".

3. Amperage, Horsepower, Voltage and number of poles per drawings- all of which shall be clearly marked on the switch nameplate.

4. Provide the Owner's project manager with one (1) spare set of fuses and two (2) sets of fuse clips/fuses for every set of fuses on the project.

J. Fuses:

1. Provide fuses at all locations shown on the Drawings and as required for supplemental protection.

   a. Fuses shall be manufactured by Bussman, Shawmut, or equal.

   b. All fuses shall be the product of a single manufacturer.

2. Main and Feeder Protection.

   a. Where rating of protective device is greater than 600A, provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.

   b. Where rating of protective device is 600A or less, provide Bussman Class RK series current limiting fuses, having an interrupting rating of 200,000A RMS.

3. Motor Protection.

a. Where rating of protective device is greater than 600A, provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.

b. Where rating of protective device is 600A or less, provide Bussman Class RK series current limiting fuses, having an interrupting rating of 200,000A RMS.

c. Where fuses feeding motors are indicated but not sized, it shall be the responsibility of the Contractor shall coordinate the fuse size with the motor to provide proper motor running protection.

d. When rejection type fuses are specified (Class RK series) the fuse holder of all switches (specified in other Sections) shall be suitable for the fuses provided.

K. Cable Tray, Flexible Cable Tray and/or Cable Runway:

1. See drawings for Cable Tray, Flexible Cable Tray and/or Cable Runway specifications.

L. Lighting Control / Dimming Systems:

1. See drawings for lighting Control and/or Dimming Systems schedules and specifications.

2. Wall box dimmers shall be rocker-type as manufactured by Lutron - no known equal. Dimmers and dimmer faceplates shall match the color of adjacent switches and faceplates. Dimmers and dimmer faceplates in wood finished areas shall generally be black unless otherwise indicated by the Architect. The Contractor shall obtain written approval of the Architect regarding final dimmer and dimmer faceplate color selection prior to ordering material. Multiple dimmers/switches shall be ganged together with a common cover plate. Provide dimmers as follows:

a.	Incandescent:	Lutron DIVA DV-10P or DV-103P (3-way) (1000 Watt max.)
b.	Electronic Low Voltage:	Lutron DIVA DVELV-300P or DVELV-303P-(3-way) (300 Watt)
c.	Magnetic Low Voltage:	Lutron DIVA DVLV-10P or DVLV-303p (3-way) (800 Watt max.)
d.	Fluorescent (3-Wire):	Lutron DIVA DVF-103P (single/3way, 8A @ 120v) or DVF-103P-277 (single/3way, 6A @ 277v)
e.	Fluorescent (0-10V):	Lutron DIVA MW-DV.
f.	Fluorescent (LutronTu-Wire):	Lutron DIVA DVFTU-5A3P with Lutron H.P. module where required.
g.	Fan Control:	Lutron DIVA DVFSQ-F (1.5A @ 120V. max, 3 speed, single pole, 3-way)

Contractor shall verify if dimmer(s) requires derating when ganged. Provide Lutron H.P. module, Lutron Power Boosters, and/or Lutron Interfaces where required to accommodate loads higher than dimmers' standard or derated load carrying capacity. .

M. Fire Alarm System/Central Monitoring System:

1. See drawings for Fire Alarm System or Central Monitoring System specifications.

Q. Fire Alarm, Clock, Security Intrusion Detection, Public Address, and Telephone Systems wiring shall be continuous from terminal cabinets or from equipment to each device. Splices are not allowed between devices and/or terminal cabinets at junction and pull boxes. Wiring shall be terminated at approved terminal blocks only.

R. All systems of wiring shall be so installed that, when completed, systems will be free from short circuits and grounds, other than required grounds. Electrical contractor shall include in his bid cost of services an approved independent testing laboratory to test all feeders insulation resistance.

The tests to be performed are as follows:

1. With a megger insulation tester, use the time-resistance method (Sometimes referred to as absorption test) to test each feeder and branch circuit wire. Tests must be conducted with wire disconnected at each end in order to test the wire itself. A second test must be conducted with the wire connected at each end and the circuit breakers or switches in the closed positions.

2. Tests shall be performed in presence of the District Electrical Inspector.

   Three copies of the test results shall be submitted to the District Electrical Inspector. Test results shall be submitted on an official form from the independent testing laboratory showing project location, test engineer, test conditions, test equipment data, and final test results.

S. Outlet Boxes and Fittings:

1. Outlet boxes used in concealed work shall be galvanized steel, pressed or welded type, with knockouts.

2. In exposed work, outlet boxes and conduit fittings required where conduit runs change direction or size, shall be cast metal with threaded cast hubs cast integral with box or fitting. Boxes and fittings shall not have unused spare hubs except as otherwise indicated or specified.

3. Fittings shall be cast metal and non-corrosive. Ferrous metal fittings shall be cadmium plated or zinc galvanized. Castings shall be true to pattern, smooth, straight, with even edges and corners, of uniform thickness of metal, and shall be free of cracks, gas holes, flaws, excessive shrinkage and burnt-out sand.

4. Covers for fittings shall be galvanized steel or non-corrosive aluminum and shall be designed for particular fitting used.

5. Light fixture outlets shall be 4" octagon, 4" square, 2 1/8" deep or larger, depending upon number of wires or conduits therein, and shall be equipped with 3/8" malleable iron fixture studs, and plaster rings. Plaster rings shall have round opening with 2 ears drilled 2-23/32" center to center.

6. For local switch outlets use 4" square 2 1/8" deep, boxes for single gang, 5" square

boxes for two-gang, and special solid gang boxes with gang plaster ring for more than 2 switches.

7. For all receptacle, clock, bell, fire alarm pull station, speaker, thermostat, telephone, and data outlets, use 4" square, 2 1/8" deep boxes or larger, if necessary, with single gang plaster rings. For television outlets, use 4-gang deep boxes and 4-gang plaster rings.

8. Plaster rings shall be provided on all flush mounted outlet boxes except where otherwise indicated or specified. All plaster rings shall be same depth as finished surface.

9. In existing plywood wall or drywall construction, and where flexible steel conduit is fished into walls, one-gang and two-gang outlets for wiring devices may be sectional steel boxes with plaster ears. Boxes shall be fastened to plywood with a flat head screw in each plaster ear screw hole.

10. Factory made knock-out seals shall be installed to seal all box knock-outs which are not intact.

11. At each location where flexible conduit is extended from a flush outlet box, provide and install a weather-proof universal box extension adapter.

T. Junction and Pull-Boxes:

1. Junction and pull-boxes, in addition to those indicated, shall only be used where absolutely necessary with specific direction of the District's Electrical Inspector in each case.

2. Interior and non-weatherproof boxes shall be constructed of blue or galvanized steel with ample laps, spot welded, and shall be rigid under torsional and deflecting forces. Boxes shall have auxiliary angle iron framing where necessary to ensure rigidity. Covers shall be fastened to box with a sufficient number of brass machine screws to ensure continuous contact all around. Flush type boxes shall be drilled and tapped for cover screws at Site if boxes are not installed plumb. All surfaces of pull and junction boxes and covers shall be given one coat of metal primer, and one coat of aluminum paint.

3. Weatherproof pull and junction boxes shall conform to foregoing for interior boxes with following modifications: Cover of flush mounting boxes shall have a weather-tight gasket cemented to and trimmed even with cover all around. Surface or semi-flush mounting pull and junction boxes shall be UL approved as rain-tight and shall be complete with threaded conduit hubs. All exposed portions of boxes shall be galvanized and finished with a prime coat and coat of baked-on gray enamel.

4. All junction and pull-boxes shall be rigidly fastened to the structure and shall not depend on conduits for support.

5. Underground Concrete Pull Boxes:

a. Precast Concrete Pull Boxes. Concrete pull boxes shall be traffic type, reinforced for H-20 Traffic bridge loading, Precast concrete. Pull boxes with inside dimensions 2'-0"x 3'-0" x 3'-0"D shall consist of a base section, top ring and cover. Base section shall have two 10"x10" knockouts in each 3'-0" side, and one 20"x20" knockout in each 2'-0" side. Pull boxes with inside dimension 4'-0 x 4'-0"x 4'-0"D shall consist of a base section, mid section, topping, and

cover. Base section shall have two 8"x 16" knockouts on each of two opposite sides, and one 20" x 20" knockout on each of the other two opposite sides. All pull boxes shall have a minimum of 6" diameter sump knockout, and 1" diameter ground rod knockout. In each pull box, furnish and install cable racks on walls. Each rack shall be equipped with 3 porcelain cable holders on a vertical steel mounting bar. Each pull box shall have 3/4" diameter pull irons. Covers shall be traffic type consisting of steel safety plate bolted to frame. Covers shall be marked "Electrical", "Power" "Telephone", "Signal" or "Ground", as required. Pull boxes shall be as manufactured by Quickset, or approved equal.

b. Provide end bells in all duct entrances. Terminate each metal conduit with insulated bushing having grounding terminal, O.Z. Type "Big".

c. Place pulling irons on opposite walls and below horizontal centerlines of ducts and bricked-up openings, and in bottom. Install pulling irons with each end hooked around a reinforcing bar.

d. Install a floor drain in every concrete pullbox into a sump containing 10 cubic feet of 1" crushed rock; minimum size 48" deep and 36" diameter. Provide 36" length of tile pipe extending down into the sump. Provide a grille over the top opening of pipe.

e. Install a 3/4" diameter, 10'-0" copperweld steel ground rod in every power concrete pull-box. Locate near a wall with 6" projection above floor for ground clamps. Permanently and effectively ground all metal equipment cases, cable racks, etc., in all pull boxes.

f. Provide a 6" deep sand base under each pull box.

g. Identify all power and signal cables by tagging in all manholes and pull boxes. Tie securely to cables with nylon cord or insulated type TW wire. Tie so that turns of wires do not form a closed electrical circuit.

h. Top of steel plate shall have a minimum coefficient of static friction of 0.5 for either wet or dry conditions, when tested for any shoe sole material. Testing and certification of the friction factor shall be conducted by an independent testing laboratory approved by the engineer, under the direction of a registered Civil or Quality Engineer. Testing shall conform to ASTM D1047 or F489 or F609, or other procedure approved by the Engineer.

6. Underground utility boxes shall be reinforced concrete with non-setting shoulders to prevent settlement following installation. Boxes shall be furnished with cast iron cover with finger hole, size as indicated on Drawings. Utility boxes shall be as manufactured by Quickset, or approved equal.

7. Manholes, vaults and pull-boxes required by utility company, and installed by Electrical Contractor, shall meet all requirements of utility company.

U. Plywood Backboards: Where indicated for telephone or communications system terminals or other equipment assemblies, provide backboards of size indicated. Use 3/4" thick x 8' tall (length per plans), Douglas Fir, void-free, kiln-dried, fire-rated plywood finished on one side and prime coat painted on all surfaces with finish coat of enamel paint, color by Architect. Leave one (1) fire-rating stamp/sheet exposed for inspection.

V. Terminal Cabinets:

1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, complete with barriered sections, a door for each vertically barriered section and sizes as indicated on plan. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.

2. Provide each terminal cabinet with a full size plywood backboard.

3. Terminal cabinets shall be installed complete with full-length skirts of the same construction and finish as the terminal cabinet.

4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.

5. All terminal cabinets and terminal cabinet barriered sections shall be labeled by the cabinet or cabinet section use (i.e. CATV, Security, etc). Labels shall be Micarta type as specified elsewhere in these specifications. Unless otherwise noted, all termination blocks and cables shall be labeled per ANSI/EIA 606 standard.

W. Painting: Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed in public view shall be painted with colors selected by the Architect to match the subject surface. Refer to painting section of the specifications for additional requirements.

X. Seismic Design and Anchoring of Electrical Equipment:

1. Seismic Protection Criteria: All Electrical and Mechanical machinery installations provided, as part of this contract located in any Seismic Risk Zone of the Uniform Building Code Seismic Risk Map shall be protected from earthquakes in accordance with the International Building Code and, as applicable, the state and local building codes and regulations. Protection criteria for these zones shall be a Horizontal Force Factor as prescribed by the IBC, or locally adopted building codes, multiplied by the machinery weight considered passing through the machinery center of gravity in any horizontal direction. Unless vibration isolation is required to protect machinery against unacceptable structure transmitted noise and/or vibration, machinery shall be protected from earthquakes by rigid structurally sound attachment to the load supporting structure. The force factor and anchorage shall be determined by calculations performed and submitted to the Architect by a professional engineer registered in state where the work is being performed (civil or structural) hired by the Contractor. The Contractor shall be responsible for the design of seismic restraint systems for all pieces of equipment weighing over 50 pounds including but not limited to the following:

   a. Switchgear, Switchboards, Distribution Boards, Motor Control Centers, and Panel boards.
   b. Conduits/Conduit support trapezes
   c. Transformers
   d. Light Fixtures
   e. Inverters, UPSs, RDCs, PDUs, Generators, Transfer Switches
   f. Cable Tray, Flexible Cable Tray, Ladder Tray
   g. Bus Duct

2. Seismic protection, labor, materials and design shall be included in the Contract sum.

Y. Trenching and Backfilling: Contractor shall be responsible for trenching and backfilling. Refer to Trenching and Backfilling section of the specifications for complete requirements.

PART 3 - EXECUTION

3.1 PREPARATION AND INSTALLATION

A. Installation of Conduit and Outlet Boxes:

1. All conduit installed in the dry walls or ceilings of a building shall be steel tube (EMT), aluminum tube (EMT), or Intermediate Metal Conduit (IMC). Flexible conduit shall not be used in lieu of EMT, IMC or rigid conduit except as noted herein.

2. Galvanized rigid conduit (GRC) or intermediate metal conduit (IMC) shall be used as follows:

- when noted on the drawings.

- when considered exposed to damage by the local AHJ.

- when installed in wet or damp locations and of a trade size where listed-raintite fittings, connectors, couplings etc. are unavailable.

- when required by NEC or CEC Article 517.13.

- when installed in concrete and masonry. The use of ENT in CMU walls and parking structures may be allowed only as directed in writing by the Engineer. Request for ENT substitution must be made prior to bid and in accordance with pre-bid substitution requests requirements of these specifications.

3. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or EMT and in accordance with NEC, or CEC where adopted, Article 342.

4. Flexible steel conduit shall only be permitted to be used at light fixture outlets and connections to vibrating electrical equipment. All flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of flexible conduit shall be allowed only as approved in writing by the Engineer.

5. Flexible liquidtight conduit shall be installed in lieu of the flexible steel; where required by the NEC, or CEC where adopted, in damp and wet location, where exposed to weather, in refrigerated area (65°F or less), and/or between seismic joints. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of liquidtight flexible conduit shall be allowed as approved in writing by the Engineer on a case by case basis.

6. Rigid metallic conduit installed underground or embedded in concrete shall be 1″ trade size minimum and shall be wrapped with 20 mil polyvinyl chloride plastic tape, PVC

conduit installed underground or embedded in concrete shall be 3/4 " minimum trade size.

7. Where required for providing an Electrical Circuit Protective System to comply with NEC, or CEC where adopted, Articles 695 and 700, utilize UL listed 2-hour fire-rated, RHH-RHW conductors in conduit.

8. Conduit shall be run so as not to interfere with other piping fixtures or equipment.

9. The ends of all conduits shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.

10. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.

11. Where conduit is underground, under slabs or grade, exposed to the weather, or in wet locations, make joints liquid tight and gas tight.

12. All metal conduit in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.

13. PVC conduit shall not be run in walls.

14. Where conductors enter a raceway or a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.

15. Where conduit extends through roof to equipment on roof area, this Contractor shall provide flashing material compatible with the roofing system as required by the roofing specifications or as required by the Owner's roof warranty. This flashing shall be delivered to the roofing contractor for installation. The actual location of all such roof penetrations and outlets shall be verified by the Architect/Owner. Contractor shall verify type of flashing prior to bid and include all costs.

16. All conduit shall be supported at intervals not less than 6'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two-hole conduit clamp properly secured.

17. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.

18. Nail-in conduit supports, one-piece set screw type conduit clamps or perforated iron for supporting conduit shall not be used.

19. Seismic Conduit Support:

    a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

CONDUIT SIZE	MAXIMUM SPACING

1/2" to 3"	6'-0"
3-1/2" to 4"	8'-0"

20. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.

21. Open knockouts in outlet boxes only where required for inserting conduit.

22. Locate wall outlet of the same type at same level in all rooms, except where otherwise noted.

23. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or bolted to studs; on wood studs attachment shall be with wood screws, nails not acceptable.

24. Recessed boxes shall not be mounted back-to-back in any wall; minimum offset shall be 24 inches.

25. Junction Boxes that do not contain any device(s) shall be located in storage rooms, electrical closets, or above accessible ceilings, not in hard lid ceilings or other forms of inaccessible ceilings. Place boxes which must be exposed to public view in a location approved by the Owner's Project Manager. Provide covers or plates to match adjacent surfaces as approved by the Owner's Project manager.

26. Surface mounted pull boxes, terminal cabinets, junction boxes, panel boards etc., shall be attached to walls using appropriate screws, fasteners, backing plates, stud blocking etc., as detailed on Architectural and/or Structural drawings. If architectural and/or Structural drawings are not provided on the Project, Contractor shall provide all necessary mounting hardware and backing support to comply with local building code requirements and any additional requirements imposed by the local Authority-Having-Jurisdiction.

27. Except where below grade, sleeves shall be installed where conduit passes through masonry or concrete walls and shall be 24 gauge galvanized steel no more that 1/2" greater in diameter than the outside diameter of the conduit. When located in non-rated structures , caulk conduit sleeve with stone wool. When located in fire rated structures, provide U.L. listed fire stopping system. See fire stopping section of this specification for additional requirements.

28. All boxes shall be covered with outlet box protector, Appleton SB-CK, or similar device / method to keep dirt / debris from entering box, conduit or panels. If dirt / debris does get in, it shall be removed prior to pulling wires.

29. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover and painted as directed by the Architect with weatherproof paint to match building.

30. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.

31. Provide nylon or a 1/8-inch O.D. polyethylene rope, rated at 250 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 5 feet of rope shall be left at each end of the conduit. Tag all lines with a plastic tag at each end indicating the termination/stub location of the opposite end of the

conduit.

32. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/racks, Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system. Support conduit to structure above suspended ceilings 8" minimum above ceiling to allow removal of ceiling tile. Maintain two-inch clearance above recessed light fixtures

33. All exposed conduits and support hardware shall be painted to match the finish of the wall or ceiling to which it is supported.

34. Where conduits or wireways cross seismic joints, provide approved flexible conduit connection or approved expansion/deflection fitting to allow for displacement of conduit in all three axes. Connection shall allow for movement in accordance with design of seismic joint. Non-flexible raceways crossing expansion joints or other areas of possible structural movement shall make provision for 3-way movement at such points by means of expansion/deflection fittings. Fittings shall be installed in the center of their axes of movement and shall not be deflected to make part of a conduit bend, or compressed or extended to compensate for incorrect conduit expansion/deflection fittings(s) complete with ground jumpers.

    Where necessary, provide approved expansion joints to allow for thermal expansion and contraction of conduit(s). Install expansion joints complete with ground jumpers.

35. Seal all conduits where termination is subject to moisture or where conduit penetrates exterior wall, floor or roof, in refrigerated areas, classified (hazardous areas) and as indicated on the drawings.

36. Except as otherwise indicated on the Drawings or elsewhere in these specifications, bends in feeder and branch circuit conduit 2 inches or larger shall have a radius or curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. Except where sweeping vertically into a building where sweep radius equals ten (10) times conduit diameter, underground communications and building interconnect conduits 3 inches or larger shall have a minimum 12'-6" radius or curvature of the inner edge. For the serving utilities, radius bends shall be made per their respective specifications.

37. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit, footage end-to-end, and the location of the other end. In wet, corrosive outdoor or underground locations, use brass, bronze, or copper 16 gauge tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.

38. The following additional requirements shall apply to underground conduits:

    a. Underground conduit shall be Schedule 40 PVC (polyvinyl chloride) unless otherwise indicated elsewhere in these specifications or as required per NEC, or CEC where adopted Article 517.13.

    b. In all cases, where any conduit(s) pass under a building slab or footing, the electrical contractor will provide a Bentonite clay or concrete barrier that conforms to the height and width of the trench excavation and is a minimum of 18" thick. In all cases, where conduit(s) pass thru a sleeve in a footing or

other foundation element, the electrical contractor will provide a Bentonite clay or concrete barrier between the sleeve and the conduit(s) surrounding the conduit(s) for the entire depth of the sleeve. The barrier is required to prevent passage of moisture under or thru the slab or footing via the trench or sleeve.

d. Where underground conduit passes under a building slab, concrete encasement may not be required, except as required above, contact the Engineer for written direction prior to omitting any encasement.

e. Underground conduits, which terminate inside building(s) below grade, such as in a basement level, or which slope so that water might flow into interior building spaces, shall be sealed at the point of penetration with a modular conduit seal (Link-Seal or equal by Rox Systems). Conduit/conduit sealing system penetrations of waterproofing membranes/systems on existing structures shall be completely restored as required to maintain membrane/system manufacturer and installer warrantee for the installation. All conduits shall be provided with a 4% slope away from buildings. All conduits shall be installed such that the water cannot accumulate in the conduit and such that water drains into the nearest manhole, pull box or vault – not into the facility. In instances where grade changes or elevation differences prevent sloping of conduit away from a building into the nearest manhole, pull box or vault or where accumulation of water in a manhole, pull box or vault may result in water traveling into the facility, conduits shall be sealed internally at each end of each conduit using conduit sealing bushing, sized as required for the conductors contained within the conduit (O-Z Gedney #CSBG 100psig withstand or equal). In all cases, install plugs or caps in spare (empty) conduits at both ends of each conduit (Jackmoon or equal) able to seal both water and gas from entering the facility via the conduits.

. f. All conduits installed underground shall be entirely encased in concrete 3" thick on all sides with multiple conduits spaced not less than 1-1/2" apart, except where otherwise specified. Provide approved conduit spacers as required to prevent any deflection of conduits when concrete is placed and to preserve position and alignment of conduits in concrete. Conduits shall be tied to spacers. Anchors shall be installed to prevent floating of conduits during pouring of concrete. Red concrete shall be used to encase conduits of systems operating above 600 volts.

g. All underground conduits shall be buried to a depth of not less than 24" below finished grade to top of the concrete envelope, unless otherwise specified.

h. Assemble sections of conduit with approved fittings and stagger all joints. Cut ends of conduit shall be reamed to remove all rough edges. Joints in all conduits shall be made liquid-tight. All bends at risers shall be completely below surface where possible.

i. Two or more conduit runs in a common trench shall be separated by at least 1-1/2" of concrete. Electric conduit runs installed in a common trench with other utility lines shall be separated from such lines by at least 12" horizontally. Public telephone conduits shall be separated from electric conduits or other utility lines by not less than 3" of concrete.

j. The District's Electrical Inspector shall be called to the site for approval of all underground installations before and during concrete pour. The Contractor shall demonstrate the usability of the underground raceways installed as part of this contract. a round, tapered, rigid mandrel shall be drawn through each run of conduit in the presence of the District Inspector, and utility company inspector where applicable, before and after pouring concrete. Mandrel shall be 6" in length minimum, and have a diameter which is within 1/4" of the diameter of the conduit to be tested. Contractor shall repair or replace any conduit(s) which will not readily pass the mandrel test.

k. Nonmetallic conduit installations shall comply with following additional requirements: All joints in PVC conduit shall be sealed by means of approved solvent-weld cement supplied by conduit manufacturer. All nonmetallic conduit bends and deflections shall comply with requirements of applicable electrical code, except that minimum radius of any bend or offset for conduits sized from 1/2" to 1-1/2" inclusive shall not be less than 24". All bends at risers and risers shall be rigid steel conduit. Radius of curve of any bend or offset, in nonmetallic conduit for public telephone system shall be not less than 10 times trade size of conduit, unless otherwise specifically approved by public telephone system.

l. Furnish and install a 6" wide polyethylene red underground barrier type 12" above full length of concrete "CAUTION ELECTRIC LINE BURIED BELOW".

m. All underground conduit systems for use by serving utility company shall meet all requirements of utility company.

B. Installation of 600-Volt Conductors:

1. All electrical wire, including signal circuits, shall be installed in conduit.

2. All circuits and feeder wires for all systems shall be continuous from over current protective device or switch to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.

a. Utilize preinsulated "winged" spring type connectors, 3M Company "Performance Plus" #O/B or #R/Y as required for splices and taps in conductors #6 AWG and smaller. When a spring connector is used in an underground environment or when subject to moisture, utilize a 3M Company Scotchcast 3507G epoxy resin connector sealing pack to seal the spring connector.

b. Wires #4 AWG and larger AWG shall be joined together as follows:

i. When located in an underground environment or when subject to moisture, the splice shall be made with compression connector and sealed by a 3M, or equal, PST cold shrink connector insulator.

ii. When located in an interior environment, the splice shall be made with an Ilsco or equal dual rated, insulated splice-reducer connector or multi-tap connector-listed for use with 75/90 degree Celsius rated conductors.

c. Connections to busbar shall be made with dual-rated copper/aluminum one-piece compression lugs. Paralleled conductor connections shall be by mechanical lugs.

3. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires.

4. Install UL approved fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.

5. For 20 ampere branch circuit wiring, increase #12 conductors to #10 for 120 volt circuits longer than 100 feet and for 277 volt circuits longer than 150 feet.

6. Conductor Support. Provide conductor supports as required by codes and recommended by cable manufacturer. Where required, provide cable supports in vertical conduits and provide lower end of conduit with a ventilator.

C. Grounding / Bonding:

1. Provide grounding and bonding for entire electric installation as shown on plans, as listed herein and as required by applicable codes. Included, but not limited to, are items that require grounding / bonding:

a. Conduit, Raceways and Cable Trays.
b. Neutral or identified conductors of interior wiring system.
c. Panel boards, Distribution Boards, Switchgear and Switchboards.
d. Non-current carrying metal parts of fixed equipment.
e. Telephone distribution equipment.
f. Inverters, UPS, PDU, RDC, Transfer Switch and Generator Systems.
g. Raised Flooring.
h. Antennas.
i. Lightning Protection Systems.
j. Metal piping installed in or attached to a building/structure.
k. Metallically isolated structural steel.
l. Metallically isolated underground metal water piping.
m. Elevator hydraulic piston/lift case.

2. In multi-occupancy buildings, Contractor shall bond metal water piping systems installed in, under or attached to a building and/or structure serving individual occupancies where the piping system(s) are metallically isolated from each other. Per NEC, or CEC where adopted Art. 250.104(A)(2) and (4), the bonding conductor shall be sized per Table 250.122 and connected to the switchboard/panelboard serving that suite/occupancy.

3. Use of Ground Rods: Furnish and install required number of 3/4" x 10' copper clad ground rods to meet specified resistance, all required grounding wires, conduit and clamps. The size of the grounding conductors shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and NEC (CEC, where adopted), unless otherwise indicated. Rods shall be installed such that at least 10 feet of length is in contact with the soil. Where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from vertical or shall be buried in a trench that is at least 30 inches deep. The upper end of the electrode shall be flush with or below ground level unless the above ground end and the grounding electrode conductor attachments are protected against

physical damage. Unless otherwise noted, connection to the grounding electrode conductor may be by compression type or exothermic process connector. Mechanical connectors shall not be used.

4. Grounding System Connection:

   a. Compression connectors shall be unplated copper, manufactured by Burndy, or approved equal, designed specifically for the intended connection.

   b. Exothermic weld-type connectors shall be 'Cadweld' manufactured by Erico Products, or approved equal, designed specifically for the intended connection.

   c. Mechanical connectors shall not be used.

5. Isolated Ground Receptacles shall have an insulated ground wire connected between the receptacle and the panelboard isolated ground bus. Unless otherwise noted, this ground wire shall not be grounded at any other point, and shall be distinguished from other ground wires by a continuous yellow stripe.

6. Provide separate green equipment ground conductor in all electrical raceways, to effectively ground all fixtures, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, busses, etc., for this purpose. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through #10 AWG. Use NEC (or CEC where adopted) Table 250.122 for conductor size with phase conductors # 8 and larger, if not shown on the Drawings.

7. Clean the contact surfaces of all ground connections prior to making connections.

8. Ductwork. Provide a flexible ground strap, No. 6 AWG equivalent, at each flexible duct connection at each air handler, exhaust fan, and supply fan, and install to preclude vibration.

9. Motors. Connect the ground conductor to the conduit with an approved grounding bushing, and to the metal frame with a bolted solderless lug. Bolts, screws and washers shall be bronze or cadmium plated steel.

10. Building grounding system resistance to ground shall not exceed 25 ohms.

D. Line Voltage and Low Voltage Power Supplies to all Mechanical Equipment Including Plumbing, Heating and Air Conditioning Units;

1. An electric power supply, including conduit, any necessary junction and/or outlet boxes and conductors and connection shall be furnished and installed by this Contractor for each item or mechanical equipment.

2. Power supplies to individual items of equipment shall be terminated in a suitable outlet or junction box adjacent to the respective item of equipment, or a junction box provided by the manufacturer or the equipment and directed by the Mechanical Contractor. Allow sufficient lengths of conductor at each location to permit connection to the individual equipment without breaking the wire run.

3. The location of all conduit terminations to the equipment is approximate. The exact location of these conduit terminations shall be located and installed as directed by the Mechanical and Plumbing Contractor.

4. Provide power supplies to all plumbing and mechanical equipment, including but not limited to, equipment furnished and installed by Owner or Contractor such as heating and air conditioning equipment, pumps, boilers, auto valves, water coolers, trap primers etc. The installation shall produce a complete and operable system.

5. Unless otherwise noted, this Contractor shall furnish and install all conduit, boxes, wires, etc., for line voltage wiring and low voltage wiring.

6. It is the Contractor's responsibility to verify with the Drawings of other trades regarding the extent of his responsibility for mechanical equipment. The bid must include a sum sufficient to cover the cost of the installation.

7. The location of all power supply connection and/or terminations to the mechanical equipment is approximate. The exact locations of these terminations shall be verified with other trades during construction.

E. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

F. Firestopping:

1. The Contractor shall be responsible for furnishing all material, labor, equipment, and services, in conjunction with the selection and installation of a complete and fully functioning and code compliant UL-listed fire stop assembly/system(s) as required by project conditions.

2. Each fire stop assembly/system shall have an "F" and/or "T" rating as required by each condition requiring fire stopping. Each fire stop assembly/system shall have a current U.L. listing, as indicated in the latest edition of the U.L. Fire Resistance Directory. Contractor shall verify acceptability of all fire stopping methods and system selections with the authority having jurisdiction prior to installation. The Contractor shall install each firestop assembly/system in accordance with the manufacturer's printed instructions.

3. Each fire stop assembly/system shall be labeled with fire stop manufacturer-furnished label on each side of the fire stopping systems depicting UL # etc.

G. Housekeeping Pads

1. Provide a minimum 3" high housekeeping pad above finished floor/finished grade for all exterior floor mounted switchgear, switchboards, distribution boards, transformers, motor control centers etc flush with the face of the equipment. Provide a minimum 3" high housekeeping pad for all floor mounted switchgear, distribution boards, transformers, motor control centers, transfer switches etc located in mechanical central plant(s) and other mechanical spaces flush with the face of the equipment. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions regarding housekeeping pads are met.

1. Unless otherwise noted above, provide a minimum 1-1/2" high housekeeping pad above finished floor/finished grade for all interior floor mounted switchgear, switchboards, distribution boards, transformers, motor control centers, transfer switches etc flush with the face of the equipment. All housekeeping pad heights are as measured from finished floor or grade. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions regarding housekeeping pads are met.

2. Provide a 1-1/2" high housekeeping pad above finished floor/finished for service equipment. Prior to pad rough-in, Contractor shall verify serving utility company's maximum meter height requirements and, if necessary, adjust height of housekeeping pad to comply with those requirements. In indoor applications, the pad shall be flush the face of the switchgear. In outdoor applications, the housekeeping pad shall extend a minimum of 4 feet from the front of switchgear/switchboard's weatherproof enclosure. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions regarding housekeeping pads are met.

3. All housekeeping pads located in, on or attached to a building shall be seismically braced/connected to the building structure.

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H. Feeder Identification

1. Lighting, power, low voltage feeder wires and cables shall be identified at each point conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of a heat shrink wire marker, which provides terminal strain relief, Raychem Shrinkmark, or Brady Permasleeve markers. Identification in other areas shall be by means of wraparound tape markers Raychem Cable Markers, or Brady Perma-Code. All markers shall include the feeder designation, size and description.

I. Tape

1. Splices, joints and connectors joining conductors shall be covered with insulation equivalent to that on conductors. Free ends of conductors connected to an energized source shall be taped. Voids in irregular connectors shall be filled with insulating compound before taping. Thermoplastic insulating tape approved by UL for use as sole insulation of splices shall be used and shall be applied according to manufacturer's printed specifications.

J. Testing

1. The Contractor shall obtain an independent NETA certified testing service that will provide all instrumentation and tests on the entire campus electrical system and all new and/or existing electrical equipment as hereinafter described and further directed by the Architect. The test shall be performed after the completion of all electrical systems. All tests shall be recorded, documented and submitted to the Architect for review. Submit three (3) copies on an official form indicating project location, test engineer, test conditions, test equipment data, ground system layout or diagram and final test results.

   a. Test for Phase to Ground/Defective Insulation Condition:
      - Open main service disconnect.

- Isolate the system neutral from ground by removing the neutral disconnect link located in the service switchboard.
- Close all submain disconnects.
- Close all branch feeder circuit breakers.
- Measure the resistance of each phase to ground. A properly calibrated "Megger" type test instrument to be used. The test voltage shall be 500 volts.
- Record all readings after one-minute duration and document into a complete report.

b. Isolating Grounds: In the event that low resistance grounds are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an acceptable value.

2. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.

   a. Perform "fall-of-potential" tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5 when suitable locations for test rods are not available, a low resistance dead earth or reference ground will be utilized.
   b. Perform the two-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points, ground rod and building steel, utility piping such as water and gas and panelboard grounds. Metal railings at building entrances and handicap ramps shall also be tested.
   c. Acceptable testing equipment: Vibroground by Associated Research, Inc.; Megger Earth Tester by James G. Biddle Company; or equivalent by Megger.

3. Provide arc flash analysis for all new and existing switchgear on campus, whether or not shown in the Contract Documents and include arc flash hazard labels.

4. Provide a complete circuit breaker coordination study from the main circuit breaker at the main switchboard down to branch circuit breakers at the panelboards. The system shall be fully coordinated such that a fault anywhere in the system will only affect the next circuit protective device ahead of the fault.

5. All instrumentation and personnel required for testing shall be provided by the Contractor at the Contractors expense.

6. All ground fault equipment shall be tested by a certified testing laboratory and shall be set as recommended by the switchgear manufacturer so as to be coordinated with other protection devices within the electrical design. Copies of the coordination test and settings shall be sent to the Architect.

7. Take and record ampere and line voltage measurements under full load on all panels and switchboard feeders and motor circuits over 10 horsepower and/or 14 amperes. Record measurements at the equipment served and submit to the Architect for review.

8. If, in the opinion of the Architect, the voltages and regulations are not met within acceptable limits, make arrangements with the serving utility for proper electrical service and then verify that such has been provided.

9. Refer to testing (additional requirements) elsewhere in this specification for additional testing requirements.

10. The maximum resistance to ground shall not exceed 5 ohms.

11. Upon completion of work, the Contractor shall make additional tests as necessary to satisfy the Owner or the Architect or his representative that the true intent and meaning of the drawings and specifications have been carried out. Contractor shall provide all instruments and labor necessary to make such tests. Any work showing faults under test, and any work not in accordance with the specifications, shall be made good by the Contractor at his own expense. Such tests may occur at anytime during the guarantee period.

END OF SECTIOIN 26 01 00

SECTION 26 01 70-GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. C.E.C. - California Electrical Code.

1.3 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 20 ohms maximum.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 01.

B. Accurately record actual locations of grounding points.

PART 2 - PRODUCTS

2.1 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch.

C. Length: 10 feet.

2.2 MECHANICAL CONNECTORS

A. Material: Bronze.

2.3 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 4/0 AWG.

C. Grounding Electrode Conductor: Size to meet CEC requirements, minimum.

D. Equipment Grounding Conductor: Size conductors based on CEC Table 250-122.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving electrodes.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated.

C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

D. Provide bonding to meet Regulatory Requirements.

E. Provide isolated grounding conductor for circuits supplying isolated ground receptacles.

F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

G. Raceway Systems: Install metallic raceways mechanically and electrically secure at all joints and at all boxes, cabinets, fittings and equipment. At the point of electrical service entrance, bond all metallic raceways together with a ground conductor and connect to the system ground bus. Bond all boxes for equipment.

H. Receptacles: Permanently connect the ground terminal on each receptacle to the green ground conductor.

I. Motors: Connect the ground conductor to the conduit with an approved grounding bushing and to the metal frame with a bolted solderless lug. Bolts, screws, and washers shall be bronze or cadmium plated steel. Remove paint where grounding bushing attaches to the disconnect switch.

J. Telecom Room: Provide one No. 6 THW copper wire in 21 mm (3/4") conduit from the main telephone cabinet to the grounding system or as indicated on drawings.

K. Ductwork: Provide a flexible ground strap, No. 6 AWG equivalent, at each flexible duct connection at each air handler, exhaust fan, and supply fan, and install to preclude vibration.

L. Bond together metal siding and other metal objects not attached to grounded structure; bond to ground.

M. Bond together each metallic raceway, pipe and duct at least at one point; bond to ground.

3.3 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of potential method.

END OF SECTION 26 01 70

SECTION 26 01 90-SUPPORTING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Conduit and equipment supports.

B. Fastening hardware.

1.2 COORDINATION

A. Coordinate size, shape and location of concrete pads with Section Cast-in-Place Concrete.

1.3 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Support Channel: Galvanized or painted steel.

B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Use expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

B. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

C. Do not use powder-actuated anchors.

D. Do not drill structural steel members without Structural Engineer approval.

E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

F. Provide conduit support systems under provisions of Section 26 01 11.

END OF SECTION 26 01 90

SECTION 26 01 95-ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Nameplates.

B. Wire and cable markers.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Division 01.

B. Include schedule for nameplates and tape labels.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.

B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

C. Conduit label markers: Color coded, weather resistant adhesive backed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates and tape labels parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws, or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Embossed tape will not be permitted for any application.

3.2 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with panel and branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING

A. Provide nameplates to identify all circuits in the service distribution and power distribution panelboards; branch circuit panelboards; separately mounted starting switches; disconnecting switches; motor control push-button stations; selector switches; terminal cabinets; telephone cabinets, etc. Clearly identify on the nameplate the equipment such as "Air Handling Unit AH-1" and "Hot Water Cir. Pump P-1" in lieu of abbreviated plan references such as "AH-1" or "P-1". In addition all voice and data racks, patch panels and workstation outlets will be labeled.

B. Provide nameplates of minimum letter height as scheduled below.

C. Panelboards and Switchboards: 1/4 inch; identify equipment designation, voltage rating, and source.

D. Individual Circuit Breakers In Panelboards and Switchboards: 1/8 inch; identify circuit and load served, including location.

E. Individual Circuit Breakers, Enclosed Switches and Motor Starters: 1/8 inch; identify voltage rating, ampere rating and load served including location.

F. HVAC and Plumbing Control Equipment: 1/8 inch; identify equipment designation and equipment served including location.

G. Communication Terminal Cabinets: 1/4 inch; identify cabinet designation and type of system.

H. Patch Panels: Will be uniquely numbered in each BDF as follows: Patch Panels A through Z; Patch panel jack numbers 1 thru 48.

I. Voice/Data workstation outlets: All workstation outlets will clearly labeled to indicate BDF room number, patch panel letter and jack number. Example “15A44” ; Indicating BDF room #15, Patch panel A, jack # 44.

3.4 RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Color for Printed Legend:

Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

Color: Black letters on orange field.

Color tracer on neutral conductors for identification. Legend: Indicate system or service and voltage, if applicable.

Control Circuits: Control wire numbers indicated on schematic or interconnection diagrams on shop drawings.

1. Self-Adhesive Vinyl Labels: Pre-printed, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
2. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, 2 inches wide, fade resistant, compounded for outdoor use.
3. Raceway/Conduits Identification Labels:
   a. All signal systems and lighting systems shall be identified with weather-resistant, fade-resistant labels identifying the system. Each system shall be color-coded as described below.
   b. Labels shall be placed by Electrical and/or Low Voltage Contractor on every conduit run, within 2 feet of every junction box or connector, and each 10 feet thereafter (1 label per every 10 feet of conduit). Labels shall wrap around conduit and placed for maximum visibility.
   c. All junction boxes, not otherwise identified, shall have a system identification label on the cover.
   d. A laminated schedule shall be posted in each electrical, mechanical, and signal room, showing each label and the system it identifies.
   e. Label Colors:

System Type	Identification	Background	Lettering
Lighting and Power	Standard Voltage	Orange	White
Cable Television	CATV	Brown	White
Clock	CLOCK	Black	White
Data	DATA	Violet	White
Emergency Circuits	EMERG	Yellow	Black
Energy Management System	EMS	White	Black
Fiber Optic System	FIBER	Pink	Black
Fire Alarm	FIRE	Red	White
Independent Public Address	IPA	Gray	White
Security/Intrusion	SECUR	Green	White
Telecommunications	TELECOM	Blue	White

END OF SECTION 26 01 95

SECTION 26 04 25-DISTRIBUTION BOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Main and distribution switchboard.

1.2 RELATED SECTIONS

A. Section - Painting.

1.3 REFERENCES

A. ANSI/CEC - California Electrical Code.

B. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

C. NEMA PB 2 - Deadfront Distribution Switchboards.

D. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

1.4 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; and 1/4-scale drawing identifying the layout of the submitted equipment within its installed location.

C. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings of all equipment and components.

D. Test Reports: Indicate results of factory production tests.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 01.

B. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept switchboards on site. Inspect for damage.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Square D, unless noted otherwise.

B. Equal by Eaton Cutler-Hammer or General Electric.

2.2 SWITCHBOARD

A. Description: NEMA PB 2 with electrical ratings and configurations as indicated.

B. Main Section Devices: Panel mounted.

C. Distribution Section Devices: Panel mounted.

D. Bus Material: Copper, standard size.

E. Bus Connections: Bolted, accessible from front for maintenance.

F. Ground Bus: Extend length of switchboard.

G. Molded Case Circuit Breakers: NEMA AB 1, integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

H. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.

I. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

J. Enclosure: Type 1 - General Purpose.
1. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

K. Accessories: A new printed single line diagram of the entire electrical distribution system as shown on the single line diagram shall be framed, plastic laminated, and mounted in the switchboard electrical room at each building. The diagram shall be a permanent

black on white mylar at least 30" x 42" in size, professionally printed and framed. Provide two (2) extra mylar drawings to Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install switchboard in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

3.2 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each, at test voltage of 1000 volts; minimum acceptable value for insulation resistance is 2 megaohms.

C. Check tightness of accessible bolted bus joints using calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.

3.3 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

3.4 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 04 40-DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.2 REFERENCES

A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E - Class R Fuses.

C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1 - Enclosed Switches.

F. C.E.C. California Electrical Code.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - DISCONNECT SWITCHES

A. Square D

B. Eaton Cutler-Hammer.

C. GE.

2.2 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F-870.

B. Enclosures: NEMA KS 1; Type 1, for interior dry locations; Type 3R for exterior or wet locations. Furnish 1 padlock and two keys for each disconnect, Master 611 or M-20.

C. Switch Ratings: Number of poles, voltage, current and horsepower rating as required for particular installation.

2.3 ACCEPTABLE MANUFACTURERS - FUSES

A. Littelfuse.

B. Gould Shawmut.

C. Bussman.

2.4 FUSES

A Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK1; current limiting, one-time fuse, 250 volt.

B. Interrupting Rating: 200,000 rms amperes.

C. Size fuses based on motor nameplate rating.

PART 3: EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches, otherwise required by Code.

C. Properly align switches and support independent of the connecting raceway.

D. Provide independent 'Unistrut' (or equal) support for connection to mechanical equipment to maintain access to mechanical equipment and meet code required clearances.

END OF SECTION

SECTION 26 05 19- LOW VOLTAGE POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

A. Basic conductor / cable types and limitations of usage. Requirements on termination to panels and vertical runs.

B. Furnish and install proper lugs in all panelboards, switchboards, gutters, etc., required to properly terminate every cable. Where paralleled conductors or conductors of large size are to terminate on a breaker a short length of copper cable (of capacity of the breaker) shall be connected to the breaker, and the proper bolt or compression type lug installed to connect this cable to the feeder cable. The cutting of cable strands to fit the breaker will not be permitted. Lugs shall be Burndy, ILSCO or approved equal.

C. Vertical cable supports shall be provided in all light and power system runs at all pull boxes or at panelboards in vertical feeders and in all other light and power system runs other than feeders at spacing's not exceeding code requirements. Cable supports shall be with split type impregnated hardwood plugs for synthetic insulated cables, O.Z./Gedney Company Type "S" for voltages to 600 and Type "R" for voltages above 2,000.

PART 2 – PRODUCTS

2.1 COPPER, 600 VOLTS

A. All conductors shall be delivered to the site in their original unbroken packages, plainly marked or tagged as follows:

1. Underwriters' labels.
2. Size, kind and insulation of wire.
3. Name of the manufacturing company and the trade name of the wire.
4. Month and year when manufactured which date shall not exceed 2 years prior to the date of delivery to the site.

B. All conductors shall be minimum of 98% conductivity, soft drawn copper. Provide stranded conductor for #8 AWG and larger or when making flexible connections to vibrating machinery. Use compression "fork" type connectors or transition to solid conductors when connecting to switches, receptacles, etc.

C. Wire shall be single conductor type THHN or THWN insulated with polyvinyl chloride (PVC) and covered with a tough protective sheath of nylon, rated at 600 volts. The wire may be operated at 90° C. maximum continuous conductor temperature in dry locations and 75° C. in wet locations and shall be listed by Underwriters Laboratories under Standard 83 for Thermoplastic Insulated Wires. Conductors shall be solid copper for #10 AWG and smaller conductors and stranded copper for #8 AWG and larger conductors. Each conductor shall be insulated with PVC and sheathed with nylon. Each wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL symbol, type designations and optional rating. Wire shall be tested in accordance with the requirements of UL Standard for types THWN or THHN.

C. Conductors shall be solid Class B or stranded Class C, annealed uncoated copper per UL

Standards 83 or 1063.

D. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.

E. Wire and cable shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color-coded and it shall be maintained throughout.

F. Systems Conductor Color Coding:

1. Power 208/120V, 3PH, 4W:
   - (a) Phase A = Black
   - (b) Phase B = Red
   - (c) Phase C = Blue
   - (d) Neutral = White
   - (e) Switchlegs = Purple (Switchlegs shall also be identified separately by numerical tags).
   - (f) Travelers = Purple with Black stripe.
2. Power 480/277V, 3PH, 4W:
   - (a) Phase A = Brown
   - (b) Phase B = Orange
   - (c) Phase C = Yellow
   - (d) Neutral = Grey
   - (e) Switch legs = Purple (Switchlegs shall also be identified separately by numerical tags).
   - (f) Travelers = Purple with black stripe.
3. Color Code for Clocks, Program Bells, Program Selector and Fire Alarm System Devices.
4. Color Code, Signal Systems: Wires for signal systems shall be color coded and shall be installed under direction of the District's Electrical Inspector. Except where otherwise specified, color coding shall be as follows:

SYSTEM	COLOR CODE
Clocks	Pink, Gray and Orange
Program Bells (Elementary Schools)	White (Common) Black
Program Bells (Secondary Schools)	White (120 volt common) Black (C.R. Program) Blue (Shop Program) Brown (Gym Program) Yellow (Aud. Fire Alarm)
Fire Alarm Bells or Horns	Black (-) and Red (+)
Fire Alarm Strobe	Brown and Yellow
Fire Alarm System Feeder or Service	Black and White

Fire Alarm Pull Stations (Non-Addressable)	Orange and Blue
Smoke Detectors, Heat Detectors (Non-Addressable)	Red (+) and Yellow (-)
Duct Smoke Detectors (Non-Addressable)	Red (+) and Yellow (-)
Fire Sprinkler Flow Switch (Non-Addressable)	Red (+) and Purple (-)
Fire Sprinkler Tamper Switch (Non-Addressable)	Red (+) and Brown (-)
White Visual Program Signal	Yellow with White Stripes, White (common)
Program Switching Unit	Blue (Hot) White (common) 4 - Black (C.R. Program) 4 - Yellow (Shop Program) 4 - Blue (Gym Program) Blue ("All" Button) 2 - Black (Spares)
Spare Wires	Black

5. Ground Conductors: Green
6. Isolated Ground Conductors: Green with continuous yellow stripe.
7 Fire Alarm System: As recommended by the manufacturer.

G. All color-coding for #12 thru #6 AWG conductor shall be as identified above. Conductors #4 AWG and larger shall be identified with utilizing phase tape at each termination.

H. No conductors carrying 120 volt or more shall be smaller than #12 AWG.

I. Aluminum conductors shall not be used.

J. Wire-pulling compounds used as lubricants in installing conductors in raceways shall only be "Polywater J". No oil, grease, graphite, or similar substances may be used. Pulling of #1/0 or larger conductors shall be done with an approved cable pull machine. Other methods; e.g. using vehicles and block and tackle to install conductors are not acceptable.

K. Connectors and terminal lugs shall be used for terminating stranded conductors #8 and larger shall be T&B, ILSCO, or equal, solderless connectors.

PART 3 – EXECUTION

3.1 COPPER, 600 VOLTS

A. Connectors and terminal lugs shall be used for terminating stranded conductors #8 and larger.

B. All branch circuit and fixture wiring joints, splices and taps for conductors #10 and smaller shall be made with UL approved connectors listed for 600 volts. Connector bodies shall consist of a cone shape expandable coil spring insert, insulated with Teflon or plastic shell.

C. Make all connections and splices necessary to properly install and complete the work, and all splices shall be taped. All tape shall be 3M "Scotch" #33 plastic electrical tape. All connections and splices shall be electrically and mechanically perfect, and in strict accordance with all code requirements.

D. Bolt type solderless connectors shall be tightened and then retightened after 24 to 48 hours before taping. DSA Inspector shall be informed of this procedure during the waiting period and shall witness the act of retightening.

E. All debris and moisture shall be removed from the conduits, boxes and cabinets.

F. No oil, grease, or similar substances shall be used to facilitate the pulling in of conductors. Use mineralac, linseed soap or specifically approved wire pulling compound.

G. Wire in panel cabinets, pull boxes and wiring gutters shall be neatly grouped, taped together with 3M "Scotch" #33 plastic electrical tape, T&B Model Ty-Rap cable strap or laced with #12 standard lacing twine and fanned out to the terminals.

H. No splices shall be allowed in any cast iron or concrete pull box, unless it is specifically called for on the drawings or it is with the specific written approval of the Architect. When splices are allowed a Thomas & Betts No. HS-LR series watertight heat shrink process jacket over the splice shall be used.

I. See paragraphs under "Panelboards" as hereinafter specified for branch circuit wiring color code.

END OF SECTION 26 05 19

SECTION 26 05 33-RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Basic definitions of conduit types and raceway applicable to this project

B. All raceways shall comply with the requirements of the Underwriter's Laboratories and shall be delivered to the site in standard lengths with each length bearing the manufacturer's trademark or stamp and the Underwriters' label of approval.

C. Where conduit is mentioned in this Specification, this shall be interpreted as rigid, standard weight steel conduit. Intermediate metal conduit (IMC), electrical metallic tubing, aluminum, polyvinyl-chloride or flexible metallic conduit shall be used only where specified herein or noted on the drawings.

D. Raceways other than conduit (in the general sense) such as wireways, cable tray, etc., shall only be used when, where and as allowed by the drawings and this Specification and in compliance with the CEC.

PART 2 – PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Conduit (GRC) shall be full weight threaded type steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing, or sherardizing process. All couplings, etc., shall be of the threaded type only.

B. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision). Couplings, locknuts and bushings for IMC shall be threaded, comparable to those specified for standard weight rigid steel conduit.

C. Electrical metallic tubing shall be galvanized or sherardized. Couplings and connectors shall be galvanized or cadmium plated, steel or die cast, insulated throat and shall be of the compression type. Approved devices are:

Manufacturer	Connector	Coupling
Appleton	TW-CSI Series	TWC-CS Series
Appleton	86T Series	95T Series
Bridgeport	250-DCI Series	260-DC Series
Regal	601S-606S Series	611-616 Series

D. Flexible metallic conduit shall be standard or intermediate weight hot dipped galvanized steel and shall have all fittings hot dipped galvanized or sherardized. Fittings shall be the squeeze type. Fittings which use a screw to bind against tubing will not be accepted. Screw-in "Jake" connectors will be accepted only if the conduit is cut "square". Aluminum flexible conduit is not acceptable under this specification.

D. Neoprene jacketed flexible metallic conduit shall be UL listed, Type UA, liquid tight (sealtite).

See this Section under "Execution" for mandatory application of liquid tight flexible conduit. Fittings shall be equal to Appleton "STN" series.

F. Factory assembled, or off-site assembled wiring systems (such as Metal Clad (MC) Cable, Type AC Cable, Type NM Cable, Type BX Cable, etc…) shall not be used unless otherwise indicated in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing.

G. When approved for use in the Allowed Specification Deviations Section, generally located on the symbols list drawing, MC cables shall be allowed for lighting branch circuits (homeruns shall be EMT), receptacle branch circuits (homeruns shall be EMT) and poke-thru fed systems furniture homeruns. MC shall not be used where exposed, except for a maximum 6' length for final connections to light fixtures, or terminate in electrical panelboards or distribution boards. Equipment ground conductor shall be green. Isolated ground conductor shall be green with yellow stripe. Provide 600V rated aluminum or lightweight steel interlocking armor Metal Clad (MC) cable with copper conductors, THHN (90 degree C) insulation, and integral equipment grounding conductor and isolated grounding conductor as required. Type AC cable listed for use in patient care areas per NEC or CEC where adopted, Article 517.13 shall be required in such areas in lieu of MC cable. MC cable shall be manufactured to UL Standard 1569. See Execution section of this specification for additional installation requirements.

H. Nonmetallic Flexible Tubing (ENT) shall not be used unless otherwise indicated in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing. Use of ENT, if allowed, is strictly limited to use in CMU walls and parking structures decks or as directed in writing by the Engineer. See Execution section of this specification for additional installation requirements.

I. Non-Metallic Conduit:

1. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only with solvent welded joints, conforming to Underwriters Laboratories, Inc. (U.L.) requirements, listed for exposed and direct burial application.
2. Conduit and fittings shall be produced by the same manufacturer.

J. Bushings for standard weight rigid steel conduit shall be nonmetallic for 1" and smaller. For conduits 1-1/4" and larger, insulated metallic bushings shall be used. Bushings shall be O. Z. Electrical Mfg. Co., Type "B" regular type or Type "BL" grounding type.

M. Electrical metallic tubing shall be galvanized or sherardized. Couplings and connectors shall be galvanized or cadmium plated, steel or die cast, insulated throat and shall be of the compression type. Approved devices are:

Manufacturer	Connector	Coupling
Appleton	TW-CSI Series	TWC-CS Series
Appleton	86T Series	95T Series
Bridgeport	250-DCI Series	260-DC Series
Regal	601S-606S Series	611-616 Series

N. Polyvinyl-chloride (PVC) conduit shall be rigid heavyweight type, Schedule 40, Underwriters' approved, complete with PVC fittings.

O. Rigid aluminum conduit shall not be used.

2.2 FITTINGS

A. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fitting shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.

B. Metallic condulet covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductors do not pass through the cover.

C. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.

D. U.O.N. all EMT fittings, connectors and couplings installed in concealed locations, areas not considered to be wet or damp locations by the AHJ, or areas not subject to physical damage, shall be steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. Where suitable for use, steel set screw fittings are allowed for trades sizes of 2″ and smaller. Insulated throat is not required for fittings, connectors and couplings 1″ and smaller.

E. All interior and exterior EMT fittings, connectors and couplings, 2″ and smaller, installed in exposed or concealed locations that are considered by the AHJ to be wet or damp locations, shall be raintite-listed, steel zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. If raintite-listed, steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. If raintite-listed, EMT fittings, connectors and couplings are unavailable for a given trade size or if conduit is installed in an area subject to damage – provide rigid metallic or intermediate metallic conduits, fittings, connectors and couplings as required.

F. Flexible steel conduit connectors shall be a malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.

G. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.

PART 3 – EXECUTION

3.1 CONDUIT INSTALLATION

A. Rigid Steel and Intermediate Metal Conduit (IMC):

1. Rigid steel conduit shall be used where subject to mechanical injury, where installed in concrete, where used exposed on exterior work and where installed exposed on interior work below 8 feet or where suspended. IMC may be used in lieu of standard weight rigid steel conduit in all cases except for above ground conduits containing conductors operating at over 600 volts.

2. Only rigid steel conduit shall be used above grade for 601 volt and higher circuits.

B. Electrical Metallic Tubing (Steel Tube):

1. Electrical metallic tubing may be used for all interior above ground applications except where noted to be rigid steel or flexible conduit in these Specifications or as noted otherwise on the drawings. All EMT shall have UL label.

2. EMT may be used where installed in floor slab of multi-story construction other than in slab on grade.

C. Flexible Steel Conduit:

1. Flexible steel conduit shall be used only where noted on the drawings, where required for connection to motors, etc., or with the approval of the Architect, where absolutely necessary due to structural conditions.

2. Plastic coated flexible metallic conduit (Sealtite), complete with proper fittings, shall be used in lieu of regular flexible conduit in all areas subject to moisture, dampness, rain; in excessively dusty or dirty areas; where subjected to constant personnel contact; for connections to all kitchen equipment; for connections to all shop equipment and where specifically called for on the drawings.

3. Flexible aluminum conduit shall not be used.

D. PVC Conduit:

1. PVC conduit shall not be used above grade except where it is specifically indicated otherwise herein, or noted on the drawings. All riser ells (as well as all conduit extensions) from PVC systems exposed or extended into masonry walls shall be rigid steel. All other riser ells extending into concealed areas above grade from underground PVC may be EMT or rigid steel at the Contractor's option. The underground portion of all steel ells shall be encased in concrete.

2. Connections, bending, cutting and installation shall be as recommended by the manufacturer.

E. Rigid Aluminum Conduit shall not be used.

F. All conduit of every type, used for electrical systems of 110 volts to ground or higher, shall have a copper ground wire installed therein. See Section under Grounding for sizing of ground wire. Conduit fill shall include the ground wire in all cases. See Section 16450.

G. Conduit shall be concealed, unless otherwise indicated. All conduit runs exposed to view, except those in attic spaces, shall be installed parallel, or at right angles to structural members, walls, or lines of the building.

H. Conduit shall be kept at least 6" from the covering on hot water and steam pipes, and 18" from the covering on flues and breaching. The open ends of all conduit shall be kept closed with approved conduit seals during the construction of the building. Use approved conduit unions where union joints are necessary. Running threads will not be permitted.

I. Conduit bends, other than factory ells, shall have radius of not less than 10 times the internal diameter of the conduit.

END OF SECTION 26 05 33

SECTION 26 09 23-NETWORK LIGHTING CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. The lighting control system specified in this section shall provide sensor-based (both occupancy and daylight), and manual lighting control.

B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed)

C. All system devices shall be networked together enabling digital communication and shall be individually addressable.

D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity even if network connectivity to the greater system is lost.

E. The system shall not require any centrally hardwired switching equipment.

1.2 SUBMITTALS

A. Product Datasheets (general device descriptions, part numbers, dimensions, wiring details, nomenclature).

B. Riser Diagrams – typical per room type (provide detailed drawings showing device interconnectivity of total quantity of devices).

C. Other Diagrams – as needed for special operation or interaction with other system(s).

D. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up.

E. Hardware and Software Operation Manuals.

F. Other operational descriptions as needed

1.3 QUALITY ASSURANCE

A. All steps in sensor manufacturing process shall occur in the USA; including population of all electronic components on circuit boards, soldering, programming, wiring, and housing.

B. All components and the manufacturing facility where product was manufactured must be ROHS compliant.

C. The sensors shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.

D. All applicable products must be UL / CUL Listed or other acceptable national testing organization.

1.4 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.

B. Coordinate lighting controls with BAS where noted on bid documents either through IP based intercommunication of system or hardwired auxiliary relay outputs.

C. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

1.5 WARRANTY

A. All devices in lighting control system shall have a 5 year warranty.

1.6 COMMISSIONING

A. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:
   1. Qualifications for factory-certified field service engineer:
      a. Minimum experience of 2 years training in the electrical/electronic field.
      b. Certified by the equipment manufacturer on the system installed.
   2. Site visit activities:
      a. Verify connection of power feeds and load circuits.
      b. Verify connection of controls.
      c. Verify system operation control by control, circuit by circuit.
      d. Obtain sign-off on system functions.
      e. Demonstrate and educate Owner's representative on system capabilities, operation and maintenance

1.7 MAINTENANCE

A. Make ordering of new equipment for expansions, replacements, and spare parts available to end user.

B. Make new replacement parts available for minimum of ten years from date of manufacture.

C. Provide factory direct technical support hotline 24 hours per day, 7 days per week.

D. Provide on-site service support within 24 hours anywhere in continental United States and within 72 hours worldwide except where special visas are required.

E. Offer renewable service contract on yearly basis, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. This specification is based on the nLight® Network Control System from Sensor Switch, an Acuity Brands Company (800-727-7483, www.sensorswitch.com).

2.2 SYSTEM REQUIREMENTS

A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time based operation.

B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.

C. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.

D. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.

E. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.

F. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.

G. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.

H. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in a remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.

I. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.

J. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces sequence of operation according to a time schedule so as to enable customized time-of-day, day-of-week utilization of a space. Note operating modes should be utilized only in manners consistent with local energy codes.

1. Auto-On / Auto-Off (via occupancy sensors)
    - Zones with occupancy sensors automatically turn lights on when occupant is detected.

- Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
- Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic On functionality.

2. Manual-On / Auto-Off (also called Semi-Automatic)
   - Pushing a switch will turn lights on.
   - Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
3. Manual-On to Auto-On/Auto-Off
   - Pushing a switch will turn lights on.
   - After initial lights on, zones with occupancy and/or photocell sensors turn lights on/off according to occupancy/vacancy and/or daylight conditions.
   - Sequence can be reset via scheduled (ex. daily each morning) events
4. Auto-to-Override On
   - Zones with occupancy sensors automatically turn lights on when occupant is detected.
   - Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
   - Sequence can be reset via scheduled (ex. daily each morning) events
5. Manual-to-Override On
   - Pushing a switch will turn lights on.
   - Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
   - Sequence can be reset via scheduled (ex. daily each morning) events
6. Auto On / Predictive Off
   - Zones with occupancy sensors automatically turn lights on when occupant is detected.
   - Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
   - If switch is pressed, lights turn off and a short “exit timer” begins. After timer expires, sensor scans the room to detect whether occupant is still present. If no occupancy is detected, zone returns to auto-on. If occupancy is detected, lights must be turned on via the switch.

K. System shall provide the option of having pre-terminated plenum rated CAT-5 cabling supplied with hardware.

2.3 INDIVIDUAL DEVICE SPECIFICATIONS

A. Networked System Occupancy Sensors
   1. Occupancy sensors system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
   2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
   3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
   4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens

for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.

5. All sensing technologies shall be acoustically passive meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
   a. Sensors shall be available in multiple lens options which are customized for specific applications.
   b. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
   c. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
   d. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
   e. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
   f. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
   g. Sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements.
   h. Network system shall also have ceiling, fixture, recessed, & corner mounted sensors available.
   i. Fixture mount sensors shall be capable of powering themselves via a line power feed.
   j. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.
   k. Sensors shall be the following Sensor Switch model numbers, with device options as specified:

Model # Series	Occupancy Poles	# of Relays	Lens Type	Detection Technology
nCM PDT 9	1	-	Standard	Dual
nCM PDT 10	1	-	Extended	Dual
nWV PDT 16	1	-	Wide View	Dual

Note: Recessed
Note: Recessed mount versions of the above ceiling(fixture) mount versions also shall be available (e.g. nCM PDT 9 => nRM PDT9)

B. Networked System Daylight (Photocell and or Dimming) Sensors
   1. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
   2. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
   3. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

4. Dimming sensors shall control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more ballasts).
5. Photocell and dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the “auto set-point” setting.)
6. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
7. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an “offset” from the primary zone.
8. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC, 277 VAC, and 347 VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load. Relays shall be dry contacts.
9. Sensor shall be the following Sensor Switch model numbers, with device options as specified:

   nCM PC (on/off))

   Note: Recessed mount versions of the above ceiling(fixture) mount versions also shall be available (e.g. nCM PC => nRM PC)

C. Networked System Power (Relay) Packs

1. Power Pack shall incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay(s), shall have an optional 2nd relay, 0-10 VDC dimming output, or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC), be plenum rated, and provide Class 2 power to the system.
3. All devices shall have two RJ-45 ports.
4. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
5. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
6. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
7. Power (Secondary) Packs shall be available that provide up to 16 Amp switching of all lighting load types.
8. Power (Relay) Packs and Supplies shall be the following Sensor Switch model Series:

   nPP16 (Power Pack w/ 16A relay)

D. Networked System Wall Switches & Dimmers

1. Devices shall recess into single-gang switch box and fit a standard GFI opening.

2. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
3. All sensors shall have two RJ-45 ports.
4. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
5. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
6. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
7. Devices with mechanical push-buttons shall be made available with custom button labeling
8. Devices with a single on button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.
9. Wall switches & dimmers shall be the following Sensor Switch model numbers, with device options as specified:

   nPODM (single on/off, push-buttons, LED user feedback)

   nPODM 2P (dual on/off, push-buttons, LED user feedback)

   nPODM 4P (quad on/off, push-buttons, LED user feedback)

E. Networked System Scene Controllers
1. Device shall have two to four buttons for selecting programmable lighting control profiles or acting as on/off switches.
2. Device shall recess into single-gang switch box and fit a standard GFI opening.
3. Devices shall provide LED user feedback.
4. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
5. All sensors shall have two RJ-45 ports.
6. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
7. Device shall be capable of selecting a lighting profile be run by the system's upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
8. Device shall have LEDs indicating current selection.
9. Scene Selector device shall be the following Sensor Switch model number:

   nPODM 2S (2 Scene, push-button)
   nPODM 4S (4 Scene, push-button)

2.4 START-UP & SUPPORT FEATURES

A. To facilitate start-up, all devices daisy-chained together (using CAT-5) shall automatically be grouped together into a functional lighting control zone.

B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.

C. Once software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.

D. All system devices shall be capable of being given user defined names.

E. All devices within the network shall be able to have their firmware reprogrammed remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.

F. All sensor devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions.

B. Provide complete installation of system in accordance with Contract Documents.

C. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

D. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors shall not have direct view of luminaries.

3.2 CLEANING

A. Clean all work under provisions of Division 01.

B. Remove all dust and debris.

3.3 DEMONSTRATION

A. Provide complete systems demonstration to District personnel for a minimum of two (2) 6 hour demonstrations on different days as dictated by the District.

3.4 AS-BUILT DOCUMENTATION

A. Provide complete As-built documentation per 260010, 1.3 minimum.

END OF SECTION

SECTION 26 22 00- LOW VOLTAGE TRANSFORMERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Type of transformers used ad the associated electrical characteristics.

B. Transformers shall be built in accordance with the latest ANSI (ASA), NEMA and IEEE Standards.

B. Dry Type: Transformers below shall have Underwriters' Laboratories approval. All insulating materials used shall be in accordance with NEMA ST20 or NEMA TR27 Standards for a 220 degrees C insulation system.

PART 2 – PRODUCTS

2.1 GENERAL CHARACTERISTICS - DRY TYPE

A. Voltage: Per the single line diagram and other information on the drawings.

B. KVA: Per the drawings, capable of overload per ANSI C57.96.

C. Ventilated dry type, 150 degrees C rise over a 40 degrees C ambient.

D. Basic Impulse Level:

600 volt and below - 10 KV

E. Taps:

5-25 KVA - 4 full capacity, two 2-1/2% above normal, two 2-1/2% below normal.

Above 25 KVA - 6 full capacity, two 2-1/2% above normal, four 2-1/2% below.

F. Maximum Sound Level, per ANSI C89.2.

0-9	KVA 40 db
10-50	KVA 45 db
51-150	KVA 50 db
151-300	KVA 55 db
301-500	KVA 60 db

G. Minimum Impedance:

+0 - 50	KVA	2.0%
51 - 112½	KVA	3.0%
113 - 225	KVA	4.5%
226 - 500	KVA	5.0%
501 and over:	KVA	5.75%

H. Coil Design:

1. 600 Volt and Under: Continuous wound construction and impregnated with non-hygroscopic, thermosetting insulating varnish

I. Core Design:

1. The transformer cores are to be constructed of high grade, non-aging silicon steel laminations with high magnetic permeability, and low hysteresis and eddy current loses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be clamped securely with heavy, structural steel members. Core assemblies shall be internally isolated for low noise production.

J. Case Design:

1. The enclosure shall be constructed of heavy gauge sheet steel. All ventilating openings shall be in accordance with NEMA and National Electrical Code standards for ventilated enclosures. Provide with lifting devices bolted or welded to the base structure, and jacking pads designed to be flush with the enclosure. The base is to be constructed of structural steel members to permit skidding or rolling in any direction. The enclosure is to be cleaned, phosphatized, primed and finished with gray, baked enamel.
2. Terminal compartment shall be located in the bottom of the transformer to ensure termination of cable leads in ambient temperature levels and to provide for side or bottom entrance of conduit.
3. Transformers shall be manufactured by General Electric, Square D Company, Cutler - Hammer or International Transformer.

PART 3 – EXECUTION

3.1 MOUNTING

A. Dry Type:

1. Transformer shall be floor mounting on spring isolators which are specifically sized for the total weight of the unit and designed to minimize transmission of 120 hertz sound. The isolators shall also be designed to provide seismic restraint in a manner and to a degree acceptable to the Department of the State Architect.

3.2 CONNECTIONS

A. Final connections to each dry type transformer shall be such as to minimize transmission of vibration. There shall be no rigid conduit or other metal to metal contact with the transformers which would transmit transformer generated noise away from the unit.

END OF SECTION 26 22 00

SECTION 26 51 00- LIGHTING FIXTURES

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

A. Fixture descriptions, electrical and operating characteristics and installation requirements.

B. Lighting fixtures shall have all parts and fittings necessary to completely and properly install the fixture. All fixtures shall be completely wired with conductors meeting applicable Underwriters' Laboratories requirements. All fixtures shall be equipped with lamps of size and type specified.

C. All fixtures shall be complete with accessories, end caps, plaster frames, yokes, hangers, etc., which are required for the specific installations and physical conditions encountered in this project.

D. The catalog numbers included in the description of the various types of lighting fixtures shall be basically considered to establish the type or class of the fixture with a particular manufacturer only. The fixture length, number of lamps, component materials, accessories and all other features required to fulfill the total description of the fixture based on all drawing and specification information shall be complied with regardless of whether or not the catalog number specifically includes these features. If any conflict exists between the catalog number and the description, the Contractor shall either resolve the conflict with the Architect prior to submittal of his bid or furnish the fixture to meet the intent as later interpreted by the Architect without change in contract price.

PART 2 – PRODUCTS

2.1 PENDENT FIXTURES

A. All pendent stem mounting fixtures shall be supplied with swivel hanger and canopy assemblies providing 45 degree swiveling at top in any direction from plumb and meeting all other requirements of the Office of the State Architect and Table 23-P Part 2, Title 24, California Code of Regulations. Swivel and canopy assemblies shall also have approved hinged connection at bottom which shall be able to withstand at least 100% seismic longitudinal load without any permanent distortion or damage of metal. Hangers with the proper degree of swivel and labeled by the Los Angeles City Testing laboratory are acceptable to the Department of the State Architect.

B. All swivel and canopy assemblies shall be suitable for the type of conduit mounting (surface or concealed) or the type of ceiling construction employed.

C. For pendent fixtures, individual fixtures shall be suspended on two swivel assemblies, and continuous rows shall be suspended on one more hanger assembly than the number of fixtures.

D. Each pendent mounted lighting fixture shall be with a safety cable or wire inside of each stem securely attached to the building structure at the top and to the fixture body at the bottom. The installed safety cable or wire shall be capable of supporting at least 4 times the fixture weight and shall be so tested, and the fixture shall be able to swing the full 45 degrees with this cable or wire installed. The Inspector shall verify this test and shall so state in his report.

2.2 SURFACE MOUNTED FIXTURES

A. All surface mounted fixtures shall be suitable for mounting on low density material.

2.3 RECESSED FIXTURES

A. All fixtures mounted in plastered ceilings shall be equipped with plaster frame.

B. Recessed fixtures must have Underwriters' Laboratories labeling for through wiring.

C. Recessed fixtures shall have Underwriters' Laboratories approved thermal protection (TP).

2.4 CONTINUOUS ROW FIXTURES

A. Fixture catalog numbers called out hereinafter are for individual units. Where two or more units are combined for continuous row installation, the Contractor shall furnish and install the necessary accessories for the indicated requirements.

2.5 DIFFUSERS

A. Unless noted otherwise, all lighting fixture diffuser shall be virgin acrylic plastic.

B. All flat plastic diffusers shall be clear with male conical prisms and manufactured from clear virgin acrylic. Lens shall be as manufactured by Rohm & Haas Co., KSH or Continental Polymers. Nominal 2' x 4' or smaller lenses shall have a minimum unpenetrated depth of 0.1045" and a minimum overall thickness of 0.1875".

C. Shaped acrylic lenses shall be manufactured from Rohm & Haas Plexiglas V, V Type 920 or VM, or approved equal using injection molding or extrusion.

PART 3 – EXECUTION

3.1 GENERAL

A. Unless specifically indicated otherwise, all lighting fixtures and/or fixture stems shall be placed symmetrically with respect to the ceiling tile pattern or other architectural ceiling and wall modules.

B. All fixtures of one type shall be of one manufacture and of identical finish and appearance.

END OF SECTION 26 51 00

SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 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.
C. Comply with TIA-607-B.

2.2 CONDUCTORS

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. Harger Lightning & Grounding.
2. Panduit Corp.

B. Comply with UL 486A-486B.
C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

D. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

4. Bonding Cable: 28 kcmils , 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Chatsworth Products, Inc.
3. Harger Lightning & Grounding.
4. Panduit Corp.

B. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

D. Busbar Connectors: Cast silicon bronze, solderless compression - type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.
2. Harger Lightning & Grounding.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1” by 24 inches in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.

2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 12 inches in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.

1. Predrilling shall be with holes for use with lugs specified in this Section.

2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: Copper-clad sectional type; 3/4 inch by 10 feet in diameter.

2.6 IDENTIFICATION

A. Comply with requirements for identification products in Section 26 05 53

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
B. Inspect the test results of the ac grounding system measured at the point of BCT connection.
C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.
B. Comply with NECA 1.

C. Comply with TIA-607-B.
D. The Contractor shall provide grounding and bonding in accordance with the requirements of NFPA 70, IEEE 142, EIA/TIA 568, TIA/ATIS-J-STD607A, state and local codes, the campus standards and to requirements specified herein. Codes shall be complied with as a minimum requirement, with these specifications prevailing when they are more stringent.

3.3 BONDING

a. Metallic conduits, wireways, metal enclosures of bus ways, cable boxes, equipment housings, cable racks and all non-current carrying metallic parts of the installed telecommunications services shall be grounded with #6 AWG copper wire. The metallic conduit system shall be used for equipment and enclosure grounding but not as a system ground conductor.
b. All metallic conduit stub-ups shall be grounded, and where multiple stub-ups are made within an equipment enclosure, they shall be equipped with grounding bushings and bonded together and to the enclosure and the enclosure ground bus.
c. Each metallic raceway, pipe, duct and other metal object entering the buildings shall be bonded together. The Contractor shall use #6 AWG bare copper conductors.
d. The Contractor shall bond telecommunications equipment and bus-bars separately.

3.4 SIGNAL REFERENCE GROUNDING AND BONDING

A. .Each identified telecommunications space within a building shall have a common signal reference ground. The signal reference ground shall conform to the following:

1. Within the building, all communication spaces shall be separately bonded to each other and connected to the primary building ground in accordance with the provisions of TIA/ATISJSTD607A. The communication ground shall not ground any other equipment or be connected to any potential high voltage source. All racks, frames, drain wires, and all installed communication equipment shall only be grounded to this common reference ground with a minimum size #6 AWG copper wire.

2. The Contractor shall provide, as a continuous #4 AWG green electrical conductor connected to a 1/4" x 4" x 5.25" telecommunications grounding bus bar (TGB) on the plywood backboard of each IDF (or telecommunication space) to terminate chassis and other equipment grounds. (NIC)
3. The ground wires from each individual BDF shall be grounded directly to the power quad metal box installed in the Cabinet. This will ground it to the Electrical ground that is connected to the Main Building Ground the same as the MDF bus bar will be connected.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. 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.

C. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches

D. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements TIA/BICSI and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than [No. 1/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.
B. 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.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.
B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 Kcmil/linear foot of conductor length, up to a maximum size of No. 3/0 AWG unless otherwise indicated.
F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install top-mounted/ vertically mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.
G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.
H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted-pair cables.
J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.
K. Access Floors: Bond all metal parts of access floors to the TGB.

3.7 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

END OF SECTION

SECTION 27 10 00
STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Provide material and labor for the installation of voice and data infrastructure for the new 3 story building as noted in this specification and as shown on the drawings. In general, data infrastructure shall be a Belden Structured Cabling Category 6A system, which is the currently approved standard for the Los Alamitos Unified School District.

B. Provide all components, items of equipment, support structure, devices, etc., required for proper system operation whether specified herein or not. Coordinate with other trades to provide additional power outlets, wiring, or raceway required in addition to that shown on the drawings. Costs for these "additional installations" shall be included in the bid proposal for work to be performed under this specification.

1.02 REFERENCES

C. American National Standards Institute (ANSI) Publication: C2-93 National Electrical Safety Code

D. Electronic Industries Alliance and Telecommunication Industries Association (EIA/TIA) Publications:

1. EIA/TIA 568A, 568-B.1, B.2, B.3- Commercial Building Telecommunications Cabling Standards
2. EIA/TIA 569B - Commercial Building Standard for Telecommunications Pathways and Spaces
3. EIA/TIA 606A – Administration Standard for Telecommunications Infrastructure.
4. EIA/TIA 607A - Commercial Building Grounding and Bonding Requirements for Telecommunications
5. EIA/TIA 758 – Customer Owned Outside Plant Telecommunications Cabling Standard
6. TIA/ATIS-JSTD-607A -2002 Commercial Building Grounding and Bonding Requirements for Telecommunications.

E. Institute of Electrical and Electronic Engineers (IEEE) Publication: 142-1991 Recommended Practice for Grounding of Industrial and Commercial Power Systems

F. California Administrative Code (CAC), Title 24

1. 2016 California Electrical Code (CEC) California Code of Regulations Title 24, Part 3, (2014 National Electrical Code with California amendments)

G. California State District, Office of the Chancellor - Telecommunications Infrastructure Planning (TIP) Standards dated February 2014

H. Underwriters Laboratories, Inc. (U.L.) Publications:

1. 83-2008 Thermoplastic Insulated Wires and Cables
2. 467 -2013 Grounding and Bonding Equipment

1.03 SYSTEM DESCRIPTION

A. The project specifications and drawings outline the requirements for the installation of a Belden Category 6A Structured Cabling System in the new gymnasium building on the campus of Los

Alamitos High School.

B. The structured cabling system provided will include both data and voice communications extended from the existing Main Distribution Frame (MDF) located in the existing facility to new Intermediate Distribution Frame(s) located in the new 3 story structure.

C. Installation will include the following:

1. Outside Plant Fiber Optic Cable
2. Intermediate Data Frame (IDF) enclosure complete with
    a. Fiber Optic Enclosure
    b. Fiber Optic Adapter Plates
    c. Fiber Optic Connectors
    d. Fiber Patch Cords
    e. Copper Patch Panels
    f. Copper Patch Cords
    g. Cable Management
3. Horizontal Copper Station Cabling
4. Workstation Jacks
5. Workstation Copper Patch Cords
6. Cabling enclosures and raceway
    a. All Mounting accessories
        1) Cable tray & snake tray
        2) D-rings; J-hooks; etc.

1.04 SUBMITTALS

A. Within thirty-five (35) calendar days after the date of the award of the contract, the Contractor shall submit to the Architect for review a complete Submittal Package. The Submittal Package shall consist of the following sections, with each section separated with index tabs.

1. Title Page
    a. Project Title
    b. Owner’s name
    c. Architect’s name
    d. Electrical Engineer’s name
    e. Contractor’s name
2. Index of Submittal Contents
    a. Each Section of the Submittal Package shall be numbered chronologically and shall be summarized in the Index.
3. Certifications
    a. Index of Certification Section Contents
    b. Valid State of California Contractors License
    c. Manufacturer’s Certifications
    d. California Division of Apprenticeship Standards (DAS) Voice/Data/Video Technician Certifications
    e. Building Industry Consultant Services International (BICSI) Registered Communication Distribution Designer (RCDD) Certification
4. Project List
    a. A substantial list (minimum of 20) of completed projects equal in scope to that specified

herein.

1) Contact information shall be made available upon request.

5. Product Data

a. Index of Equipment Data Sheets
b. Manufacturer’s Data Sheets including cable types

6. Shop Drawings

a. Scaled drawings of Intermediate Distribution Frame (IDF) rack(s) or cabinet(s) indicating layout of equipment within rack. Identify equipment within rack.

B. Closeout Submittals.

1. All original equipment documentation and manuals provided by the equipment manufacturers shall be safeguarded and turned over to the District at the completion of the project.

2. Provide the following to District. Contractor shall be responsible to provide the required information in a timely manner subsequent to final IOR testing and completion of punch list work.

3. Operation and Maintenance Manuals

a. Three complete sets of maintenance instructions, system/component data sheets and operating instructions shall be bound into three ring binders permanently labeled "Data Network Systems" and delivered to the District Technology Consultant.

1) Preface the manuals with a typewritten sheet in a plastic protector identifying the system installer by business name, address and telephone number.
2) The manuals shall include all approved submittal information, product data sheets, spare parts list

4. As-built drawings shall have building backgrounds with room numbers, devices with address, and no conduit/wiring lines.

1.05 QUALITY ASSURANCE

A. All components shall comply with applicable standards of the Underwriter's Laboratories, Inc.

B. The installation of the data infrastructure shall meet ANSI/TIA 568-C- series optical fiber cabling Standards. The ANSI/TIA-568 family of Telecommunications Standards contains the requirements for balanced twisted-pair and optical fiber cabling, which provide the foundation for the design, installation, and maintenance best practices described in BICSI's Telecommunications Distribution Methods Manual (TDMM). With the published '568-C.0, '568-C.1, '568-C.2, and '568-C.3 Standards to ensure support of these future data transmission speeds, the District has selected specific wiring components as the approved standard to be used during permanent, new data cable installation. These component standards are described in this specification section. The District has chosen a structured network cabling system that provides a standardized media and layout for the backbone and horizontal cabling, standard connection interfaces and a consistent and uniform network design across all buildings on this project. In support of this system, the District has chosen the Belden Partner Alliance “PA” copper connectivity, copper cable, and fiber optic cable; and Mohawk Company outside plant copper cable as the preferred components for the network. The project shall be completed by a Belden PA capable of offering the Belden Networking Systems Warranty in compliance to receive Belden’s 25-year warranty.

C. Review the Drawings and Specifications for work and material provided by others that might affect work specified under this Division. Contractor is required to coordinate with other trades, equipment suppliers, contractors, etc. to insure a high quality reliable installation with a minimum of construction delays. All work required to be re-accomplished due to lack of

coordination shall be done at the Contractor's expense.

D. Work and materials shall meet or exceed the requirements of the rules and regulations of the State of California, NFPA, CAL-OSHA, AND NECA - "Standard of Installation". Installation showing evidence of poor workmanship or not in accordance with these Specifications or the Drawings shall be re-accomplished or repaired to the satisfaction of the Architect at the Contractor's expense.

E. All equipment and systems specified in this Section shall be provided and installed by a single Special Systems Contractor who will be responsible for proper operation of all these systems.

F. All new outlets shall conform to the ANSI/TIA/ 568-C series of standards and addenda. The District requires that 4-pair Category 6A, UTP be used in all new cabling installations to support a 10G BaseT LAN configuration and that the 4 pairs be terminated on their own dedicated data cross-connect blocks using the 568B wiring configuration. Voice and data cables must be in separate sheaths.

G. Network Systems Contractor Requirements

1. The Contractor shall hold a valid and active California State C-7 Low Voltage Systems and C-10 Electrical Contractor's license.

2. The Contractor must be currently certified as a Belden Partner Alliance (PA) installer and certification shall remain valid during the course of the installation agreement, with no known pending action or intent by Belden and/or the Contractor to terminate or limit status as a manufacturer certified designer and installer. Note: Respondent status as a Belden PA certified designer and installer applicant or pending Belden certified designer and installer approval from Belden is unacceptable.

3. The Network System Contractor shall have at least one prior year with Belden Partner Alliance certified status including the right and ability to deliver a completed installation conforming to Belden warranty program requirements; additionally, the Contractor must have completed at least five similar projects as a certified designer and installer. The contractor shall have personnel specifically trained and certified under the manufacturer’s installation training program, including the willingness and intent to assign installation project resources in a manner which utilizes certified personnel for each and every project manager and foreman/supervisor position associated with providing services to meet Los Alamitos USD installation requirements.

4. The Contractor shall have been in the structured cabling pathway implementation business under his current organizational structure, either directly or under wholly owned predecessor for a minimum of five years. Contractor must maintain a full-time service staff at an established business location having the appropriate parts and service facilities. An individual operating out of residential facilities or without the required facilities, staff, or tenure will not be considered as an acceptable contractor for this project.

5. Other requirements the Contractor must have:

a. A profitable status for at least the two preceding fiscal years (three years if privately held and not submitting financial statements).
b. No significant pending litigations, which may subject the company to financial risk exceeding twenty percent of its value.
c. At least one Registered Communication Distribution designer (RCDD) certified by Building Industries Consultant Services International (BICSI) employed, including the willingness and intent to assign such personnel to this project as project engineer or project manager.

1.06 WARRANTY

A. The Belden Partner Alliance Contractor shall assume all responsibility for the proper operation of the entire system. The complete system shall be guaranteed free from defects in material or

workmanship for a period of two years after filing of the "Notice of Completion". Provide on-site service for all systems for the duration of the guarantee period at no additional cost to the District. Where system trouble is caused by misuse, abuse, or accident, current labor rates shall be chargeable for the service call otherwise, the service shall be free. Service shall normally be available from a factory authorized service center during normal working hours and within 24 hours of receiving a call.

PART 2 - PRODUCTS

2.01 REQUIREMENTS FOR MATERIAL AND EQUIPMENT

A. Copper Cable Standards

1. Horizontal Station Cabling

a. For horizontal station cabling within walls and ceilings, the following cable is required:

Cable Type	Vendor Product Number	Description
Indoor/ Outdoor	Belden 2148A Cat 6A Indoor/Outdoor CMR/CMX Outdoor rated	24 AWG bare copper conductors with Black FR Polyolefin jacket and flooded for moisture protection
Plenum	Belden 10GXS13 Cat 6A 500 MHZ Copper Cable	All interior cables shall be rated for Plenum to match other projects completed or under construction. 23AWG bare copper bonded pair Cat 6A Small OD (.265) cable.
Non Plenum	Belden 10GXS12 Cat 6A 500 MHZ Copper Cable	with thermoplastic insulation 23AWG bare copper bonded pair Cat 6A Small OD (.265) cable.

b. These cables are certified by ITS labs (ETL), to meeting ANSI/TIA/EIA-568-C.1, and 1000BASE-T requirements. The contractor will ensure that the cable will be installed with no less than a 10 foot service loop at both ends of cables (Where the cable is only in conduit or raceway, leave 2' of loop at the IDF Cabinet). The contractor will ensure that all runs of station cabling do not exceed 90 meters (295 feet) from patch panel to wall outlet. Service loops need to be coiled and secured to a j-hook (This is to be done only in areas where j hooks are used).

c. Cable runs supported by j-hooks require maximum distance of 48 inches between j-hooks.

2. Outside Plant Copper

a. The outside plant Category 6A copper cable shall be Belden Gel-Filled; District Standard, no "or equals" or "substitutions" allowed. These shall be used where outlets are served by an IDF Cabinet in a different building and the cables are placed in underground conduit.

Type	Vendor Product Number	Description
Belden OSP6AU Outside Plant rated Cat 6A cable	Belden OSP6AU	Category 6A Rated Outside Plant Cable

b. These cables are certified by ITS labs (ETL), to meeting ANSI/TIA/EIA-568-C.1, 1000BASE-T requirements. The contractor will ensure that the cable will be installed

with no less than a 10 foot service loop at both ends of cables. The contractor shall ensure that all runs of station cabling do not exceed 90 meters (295 feet), from patch panel to wall outlet.

3. Station Jacks

   a. Los Alamitos District Data Center will be cabled with Belden 10GXS Copper cabling system and Key Connect faceplates for information outlets. These connectors are component rated and rated for 10G00 transmission.

Type	Vendor Product Number	Description
Individually-Packed	Belden 10GXS Modular Jacks RVAMJKUIV-S1 **Colors to be used shall be verified with District Rep prior to submittals.**	RevConnect 10GX UTP Modular Jack, T568 A/B, Single Pack

   b. **The** following enclosures are acceptable:

Type	Vendor Product Number	Description
Wall Mount Faceplate	Belden AX103922	Single Outlet Faceplate, Electric - white
Wall Mount Faceplate	Belden AX103923	Duplex Outlet Faceplate, Electric - white
Wall Mount Faceplate	Belden AX102248	Quad Outlet Faceplate, Electric - white
Rectangular Faceplate	Belden AX103927	Rectangular Faceplate, Electric-white
Surface Box Mounting	Belden AX104134	4 Port Side-Entry Universal Mount Surface Box.
Angled 4 Port Faceplate	Belden 102432	Electric Ivory 4 Port angled Faceplate.

4. Patch Cords

   a. Patch cords within the wiring closets will conform to Belden's 10GXD structured cabling system specifications. Patch Cords shall be provided in various lengths to support the varying size of the cabinets and to ensure that patching is provided in a neat and

orderly fashion. All new installations will use the Belden 10GX Bonded Pair Patch Cord.

b. The contractor will provide sufficient patch cords to connect all data jacks to the network electronics, as follows:

Type	Vendor Product Number	Description
Modular 4-pair cord	Belden CAD11106XXX	CAT 6A UTP, length (xxx), blue color, small diameter.

c. The contractor will label all patch cords at both ends, with the jack label, using Los Alamitos Unified School District's standard labeling scheme. Before a labeling scheme is actually started, obtain approval from the District Information Technology Rep and the Telecom Engineer.

d. Patch cords shall be made available before each phase of construction begins. Contractor shall be responsible for installation of all patch cords in a professional manner within vertical and/or horizontal management trays. Patch cord placement will be reviewed by the District and/or District Representative and at the District's request will be redone if not installed satisfactorily. Patch cords shall be installed by the Contractor 2 weeks prior to completion of each phase. Contractor shall notify the District when complete so that District may review the installation.

5. Station Cords

a. The contractor will furnish station cords to be used within the classroom / admin environment. Station cables will be 1 meter, and 3 meters in length. For wireless access point locations provide one meter length, for clock / speaker locations provide one meter length, for all other workstation locations provide 3 meter length. All new installations will use Belden 10GX Bonded Pair UTP Modular Cords.
b. The contractor will provide sufficient patch cords to connect all data jacks to the network electronics, as noted in a. above. Lengths to be coordinated between patch panel and switch port.
c. All station cords will need to be available before first phase of construction begins. Visual inventory shall be performed by the District Technology Consultant. The appropriate amount of station cords needed to complete each phase shall be distributed to the District IT Department two weeks prior to the end of the phase.
d. Computer Lab (Media Center) station cords. Provide custom length station cords for all computer stations located at Media Center computer Lab. Patch cords shall be secured in furniture chase. The station cord lengths shall be submitted to district based on the final arrangement of computer lab furniture and computer layout. Coordinate with District prior to customizing station patch cords.

6. Patch Panels

a. Horizontal station cabling must not terminate directly onto the network electronics. Cables will terminate in the wiring closets on RJ-45 patch panels with flexible modular panels. Each jack termination on the patch panels will be labeled according to Los Alamitos Unified School District cable labeling standards (Again, coordinate with IT Rep before commencing labeling). All horizontal station cables will terminate on the modular panels and be wiring compliant with the Cat 6A UTP standards. The following patch panels have been selected:

Type	Vendor Product Number	Description

48-port patch panel kit	Belden AngleFlex 48 Port Patch Panel with 10GX RevConnect Modules 2RU	Flexible 48 Port AngleFlex Panel loaded with T568A/T568B, RJ-45 connectors, comes complete with cables guides and labeling kit

B. Fiber Optic Cable Standards

1. Outside Plant Fiber

a. The fiber cable for MDF-to-IDF feeds will be laser optimized (OM4) multimode 50/125-micron (TIA – 492AAAD, ANSI/TIA – 568 -D.3) & 12 strand multi-mode with 12 strands of OS2 single mode where indicated on the drawings, all dielectric, general purpose.

b. The multimode cable must comply with the following minimum transmission parameters:

Attenuation[1]		Bandwidth[2]	
850 nm	1300 nm	850 nm	1300 nm
3.0 dB/km	1.2 dB/km	3500 MHz km	500 MHz km

[1]Maximum Individual Fiber Loss (cabled).
[2]Minimum Individual Fiber Bandwidth (cabled).

c. Outside Plant cable must be terminated in a fiber distribution panel within 50' of the "point-of-emergence" if not in conduit.

d. These cables must meet ANSI/TIA/EIA-568-C, and 1000BASE-T requirements. The contractor will ensure that the cable will be installed with no less than a 10 foot service loop at both ends of cables.

Type	Vendor Product Number	Description
OSP Fiber Optic Cable	Belden Cable Central Tube Single Jacket Plenum Cable, Type OFNP	12 strand OM4 and 12 strand OS2, Indoor / Outdoor Rated.

2. Fiber Optic Connectors

a. Field connections are required for all fiber strands in the MDF and IDF's. All connectors to be glass-in-ceramic Belden Brilliance AX105207 Pre-Polished Fiber Connectors SC-compatible field-installable multimode connectors.

b. The contractor will provide fiber optic patch cords for use in the closets. At *the MDF,* dual fiber patch cords (1 meter in length) will be provided for 50% of the available terminations. At the IDF's, two (2) dual fiber patch cords (1 meter in length) will be provided for each. Prior to ordering fiber optic patch cable verify connection type and length with Owner. The following fiber optic patch cords have been selected:

Type	Vendor Product Number	Description
SC-LC Fiber Optic Patch cords	Belden FP4LDSDXXXXR2XA	50/125um Laser Optimized Multimode (OM4) SC-LC duplex jumper

3. Fiber Optic Patch Panels

a. For IDF Cabinets with less than 24 fiber terminations, District has standardized on

rack-mountable patch panels Fiber Enclosures, with terminations of up to 24 connections. The recommended products are:

Type	Vendor Product Number	Description
Fiber termination shelf	Belden ECX01U Rack Mount Fiber Cassette Enclosure	19 inch rack mountable Fiber Connect Panel enclosure holds 4 FX Ultra Cassettes – 1 Rack Unit.
Connector Panel	Belden FFX4X06SD and FFSX06SD Cassettes with appropriate adapters and connectors.	ECX Ultra HD Cassettes loaded with OM4 and OS2 SC Adapters and connectors.

b. For the rack in the MDF, a 4-Rack Unit, Enclosure that holds 12 ECX Ultra Cassettes and associated adapters and connectors shall be used AX105166.
c. Fiber will directly terminate on the patch panel couplings without additional splicing. Sufficient cable slack to allow for movement and rack relocation will be required (no less than 10 feet).

4. Data Racks and Cable Management

a. MDF and IDF Racks/Cabinets shall be Belden XDR8419-310 or Equal. MDF Rack shall be 84” in height and shall be capable of accepting 19” wide EIA equipment. IDF cabinets equipment mounting rails shall be tapped #10-32 and be adjusted to 4 ½” back from the front of the cabinet. The equipment mounting rails will include printed rack unit numbering from top to bottom in ascending order.
b. All data racks / cabinets are to be grounded. Rack / cabinet construction method shall ensure an electrically bonded structure for ease of grounding.
c. Coordinate placement of MDF racks with District Technology Consultant prior to installation.

Type	Vendor Product Number	Description
Floor Mounted Data Cabinet (MDF)	Belden XDR8419-3102836 Or equal by Black Hawk Labs.	19” X 7’ Floor Mounted Data Enclosure – Black (4 post racks) Provide power strip surge protected, NEMA 5-30R (non-locking type),Horizontal and vertical cable manager and mounting bracket.
Vertical Cable Manager	Belden BHVL006	84” H x 6”W Front/Rear Manager
Horizontal Manager	Belden BHH192UC	19” x 2U Horizontal Cable Manager
UPS (District Furnished Contractor Installed)	Coordinate with District for Specific type of UPS provided at each IDF/MDF. Receptacle type/size and NEMA configuration shall	6.5KVA UPS

	match installed UPS. See above for wall mounted and Hubbell Rebox type IDF cabinets, for required NEMA configuration	

5. Cable Runway

   a. All cable runways shall be installed according to MDF elevation or plan views.
   b. Required connectors, butt-splices, junction-splice, j-hooks and other attachment fittings shall be used to complete the assembly.
   c. Protective end caps shall be installed on all exposed cable runway ends.
   d. Wall angles shall be attached to 1 ½" unistrut bars that have been securely bolted to the wall framing with lag with minimum 3' embedment into the wood framing member. See attachment detail drawing.
   e. Where vertical all-thread rods are used to support ladder sections, a protective covering shall be installed over the all-thread rod.
   f. Cable runway shall bond to the TMGB, TGB or CBN with a #6 GREEN Stranded conductor.
   g. All cable runway sections shall be bonded to each other using the manufacturer's kit.

Type	Vendor Product Number	Description
Cable Runway (Ladder Rack)	Cooper B –Line SB-17U	12" Cable Runway, Black
-Butt Splice Kit	Cooper B-Line SB-2107-BZN	Butt Splice Kit
Junction Splice Kit	Cooper B-Line SB-2101-A-BZN	Junction Splice Kit
Rack-to-Runway Mounting Plate	Cooper B-Line SB-2133-12-KFB	Channel Rack-to-Runway Mounting Plate with Hat Bracket
Support Bracket	Cooper B-Line SB-213-12 KFB	Triangular Support Bracket
J-Bolts	Chatsworth 11431-001	J-Bolts
Wall Angle Support Kit	Cooper B-Line SB-2113-FB	Wall Angle Support Kit
Protective End Caps	Cooper B-Line SB-21-B	Protective End Caps, Cable Runway
End Closing Kit	Chatsworth 11700-712	End Closing Kit
J-Hooks	Cooper B-Line BCH Series	BCH12-W2
J-Hooks	Cooper B-Line BCH Series	BCH21-W2
J-Hooks	Cooper B-Line BCH Series	BCH32-W2
J-Hooks		BCH 64

C. Provide all keys and special tools provided for each equipment to District prior to acceptance by district as part of close out documents.

D. Provide labeling for all interior Loudspeaker/clocks and Exterior Horn/speakers. Labels shall

be visible from outside for easy identification of installed cabling.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The installation shall be accomplished by and under the direction of skilled electronic craftsmen, factory trained by the equipment manufacturer, and experienced in the installation of systems of this type in the State of California. Workmanship shall be of the highest quality.

B. Note that the general installation requirements of Electrical Division, “Basic Materials and Methods” apply to work performed under this Section.

C. All wiring shall be neat and orderly. Disorganized installation of wire and cable will not be allowed. No splicing allowed. Absolutely no connections are to be made in wet locations or below grade.

D. Punch list items and contractor corrections shall be completed no more than 30 days following issuance to the contractor or unless agreed to otherwise by the district.

E. Label outside of IDF cabinets with appropriate names per plan with non-removable stencils. Get prior approval from district before installation of stencil

F. Label all cables at 12 inches from each end with Brady "Omni-Grip" devices or the equivalent.

G. The conduit, outlet boxes, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete as described and otherwise required in other sections of this Division 16 Specification.

H. Size all wires and cables as required specifically for each installation. The requirements of this specification and the Drawings indicate minimum requirements. Coordinate box, terminal cabinet, and conduit sizes required with other trades as needed.

I. For all copper cabling inside permanent buildings and relocatable with IDF’s, Category 6A UTP cabling is required.

J. Category 6A UTP Jack Modules at station jack locations shall be color coded as follows:

3. Teacher Workstation – Ivory Jack/Blue Cable. ** Length: 1 meter at jack and 3 meters at IDF/MDF. (All patch cords shall be provided by Contractor).
4. Student Workstation – (2)-Blue Length 1 meter at jack and 3 meters at IDF/MDF. (All patch cords shall be provided by Contractor).
5. Clock/Speaker – (1)-Gray jack/red cable/red patch cord, with 1’-0” patch cords. (All patch cords shall be provided by Contractor).
6. Wireless Access Point – (1)-Orange, with meters (10’-0”) patch cords coiled above ceiling. (All patch cords shall be provided by Contractor).
7. Video – (1)-Yellow with 1’0” patch cords.(All patch cords shall be provided by Contractor).
8. Fax/Red Phones POTS lines-White jack/red cable. Length 1 meter at Jack and 3 meters at IDF/MDF/MPOE. (All patch cords shall be provided by Contractor).
9. IDF -2’X2’36”: Preliminary 3’0” Patch cords (All patch cords shall be provided by Contractor).
10. IDF Slim Line Box (Hubbell Rebox): Preliminary 3’0” patch cords (All patch cords shall be provided by Contractor).
11. MDF Room Rack: TBD (All patch cords shall be provided by Contractor).

a. Workstations: 3 meters (10’-0”).
b. Wireless: 3 meters (10’-0”).

K. Provide identification labeling of all communication conduits and cables at IDF/MDF/Vaults/pull boxes, fax, Telephone lines.

(Color Scheme and patch cords shall be confirmed and provided as directed by the School IT Director)

3.02 TESTS, INSTRUCTION AND DOCUMENTATION

A. The entire system shall be tested and adjusted under the supervision of the Contractor's electronics engineer.

1. Provide all instruments for testing and demonstrate in the presence of the District's Representative that all audio, video, telephone, and signal circuits and wiring are free of shorts and grounds and that the installation performs as required and is as specified herein.

2. Any defects or abnormalities shall be corrected at once and the test re-conducted to demonstrate proper operation at no additional cost to the District.

3. A complete report of all these tests shall be prepared by the testing personnel and signed by them. The report shall include the date the testing was conducted a narrative describing each test and the results of all testing upon correction of all defects. The site inspector shall be informed of the testing schedule and his signature shall appear on the report attesting to the fact that these tests were conducted. The original copy of the final signed report shall be submitted to the Architect; and following his review, copies of the report shall be included in the operations and maintenance manuals provided to the District.

B. Cable Testing- NO FAIL OR MARGINAL PASS RESULTS WILL BE ACCEPTED

1. The contractor shall perform all pretests and adjustments. All final testing shall be performed with the District Technology Consultant present for 100% of the project testing. The contractor will furnish all test equipment necessary and perform all work required to determine or modify performance of the system in accordance with these specifications. Valid copper test tools may include a field tester level III or equal.

2. The contractor will submit a complete test plan for Copper Station Wiring/Information outlet and Fiber Optic Cable systems to be used for this contract. At minimum, the plan should show test configurations, calibration procedures, impedances, and measurement equipment. This plan must be approved prior to the start of testing. The test plan is a one-time requirement and will remain in effect for the duration of this contract unless specifications change requiring a re-submittal. The scope of this work includes, but is not limited to, the following:

   a. Check all system(s) for compliance with the Performance Standards and Specifications
   b. Maintain a check-off list for reference by the District during tests.
   c. The result of the measurements outlined shall be recorded and submitted as final proof of system performance.
   d. All systems must pass specifications and be accepted before the work will be considered complete.

3. Station Wiring/Information Outlet

   a. All jacks should be tested with a Fluke Networks DSX tester and assigned its appropriate circuit id number with auto test. All outlets will be tested in accordance with The Belden Partner Alliance Networking System Warranty requirements.
   b. Category 6A UTP:
   c. Station wiring/information outlets (100%) will be tested to proposed Category 6A standards (ANSI/TIA- 568-C) and must adhere to The Belden Partner Alliance CSV 25 Network Systems Warranty parameters for Category 6A. Test MUST be 100% pass (with no marginal results) and will be reviewed by telecom engineers and District for approval.
   d. Category 6A outside Plant Cabling:
   e. All station wiring/information outlets (100%) will be tested to proposed Category 6A standards (ANSI/TIA -568-C). These locations will be tested and must adhere to The Belden Partner Alliance CSV 25 Networks Systems Warranty. for Category 6A.

C. Fiber Optic Cable Testing

1. All fiber supplied to the District must be tested before installation, while still on the shipping reel, using an optical time domain reflectometer (OTDR). A discrepancy of more than 1 dB on any fiber in either window indicates possible shipping damage and the fiber must be returned to the supplier. The test results must be maintained in a file for future reference. The contractor is responsible for insuring fiber integrity and performance specifications.

2. All fiber must be tested after installation according to the procedures and acceptability criteria described in EIA/TIA 568-C.3 and all applicable addenda after installation and termination using a Fluke Networks CertiFiber Pro OLTS. All fiber Cables shall be tested to TIA 568-C.3 standards for Optical Loss. The results of these tests (printed OLTS PASS results) must be provided by the installer as documentation of the quality of installation and as a baseline for future troubleshooting. All optical test equipment must have current, traceable manufacturer approved calibration certification.

END OF SECTION

SECTION 27 30 00
IP BASED DISTRICT WIDE INTEGRATED COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. The contractor shall expand the existing IP Based District Wide Integrated Communication System to encompass the scope of work indicated in plans for this project.

B. **By submission of a Prime Bid for this project, the Prime Bidder assumes complete and total responsibility for himself and his subcontractors' compliance with this specification in its entirety. If found to be not in compliance with any part of this specification, the Prime Bidder shall bear any burden, financial or otherwise, required to complete the work of this specification to the total satisfaction of Los Alamitos Unified School District.**

1. The expansion of the IP Based District Wide Integrated Communication System Intercommunication and Program System shall be performed and all equipment shall be installed by a member in good standing of the AtlasIED Certified Integrator Program who has achieved Platinum Status at the time of the bid. Upon demand by the owner or his representative, the Prime Contractor shall provide proof that he or his listed subcontractor was a member in good standing of the AtlasIED Certified Integrator Program who has achieved Platinum Status at the time of the bid. Failure to produce said proof shall render the Prime Contractor's bid non-responsive and shall be considered grounds for immediate disqualification of his prime bid.
    a) The AtlasIED Platinum Certified Integrator shall furnish all labor, materials, appliances, licenses, tools, equipment, facilities, transportation and services necessary for and incidental to the performance of all operations in connection with furnishing, delivery and installation of all equipment, cabling, programming, configuration, testing and training required by this Section, complete as indicated in the applicable Contract Drawings and/or specified herein.
        1) **Equipment furnished and/or installed by contractors who are not AtlasIED Platinum Certified Integrators shall be considered in non-compliance with this specification and subject to replacement at the expense of the Prime Contractor.**

C. The IP Based District Wide Integrated Communication System software currently resides and is under the control of Los Alamitos Unified School District Information Technology Department. All added hardware devices and cabling shall be compatible with the existing system software.

1. All Data Networking, cabling and connectors shall be provided by the data networking contractor and shall comply with the requirements of that specification section.
2. All Data Networking electronics shall be provided by the District Information Technology Department.
    a) Ports and IP Addresses, as required, shall be provided by the District Information Technology Department.
3. All Speakers, Clocks, Licenses, Backboxes, Zone Controllers, Scrolling Message Devices and Programming shall be provided by this contractor and shall comply with the requirements of this specification section.
    a) Contractor shall provide Mac Addresses, with specific location descriptions, to the District Information Technology Department.

D. This specification provides the requirements for the installation, programming and testing of all hardware devices provided under this system expansion.

E. Any material and/or equipment necessary for the proper operation of the system expansion, which is not specified or described herein, shall be deemed part of this Specification.

1.02 QUALIFICATIONS

A. Equipment

1. This specification is based on the equipment of manufacturer(s) who have been approved by the Los Alamitos Unified School District Information Technology Department.
2. The equipment manufacturer shall be a United States manufacturer, who has been regularly engaged in the manufacture of Integrated Communications Equipment for at least twenty-five (25) years.
3. **The compatible hardware devices for expansion of the IP Based District Wide Integrated Communication System shall be the product of AtlasIED. No substitutions shall be approved.**
4. It is the Contractor's responsibility to meet the entire intent of these specifications. Deviations from the specified items shall be at the risk of the Contractor until the date of final acceptance by the Architect of Record, Engineer of Record and the Owner's representative. **All costs for removal, relocation or replacement of a substituted item shall be at the risk of the Prime Contractor.**
5. All equipment shall conform to currently adopted applicable codes and ordinances.

B. System Supplier/Installer
1. **All equipment for this expansion shall be furnished and installed by a member in good standing of the AtlasIED Certified Integrator Program who has achieved Platinum Status and whom has been trained and certified trained and certified by the Manufacturer in the proper installation, programming, testing, service and maintenance of the system specified herein.**
2. Subsequent to a successful bid and upon request of the Owner the System Supplier/Installer shall submit a qualification documentation package which shall include the following:
   a) Evidence of current status as a **member in good standing of the AtlasIED Certified Integrator Program who has achieved Platinum Status**
   b) Certificates issued by AtlasIED for System Supplier/Installer employees trained on this system.
   c) A list of twenty (5) completed projects of equal scope, with associated Owners Representative contact names and telephone numbers.
      1) **A minimum of five (2) of the completed projects required above shall be Los Alamitos Unified School District projects.**
   d) Evidence of current State of California Contractor's License, C-10 and C-7.
   e) Upon request, the System Supplier/Installer shall show satisfactory evidence, that he maintains a fully equipped service organization capable of furnishing adequate inspection, service and maintenance of the system.
   f) The System Supplier/Installer shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.
   g) The System Supplier/Installer shall provide proof that they maintain a complete service and maintenance center within 20 miles of the project address. A complete service center shall include replacement parts in stock in the quantities deemed sufficient by the owner or its representatives.

1.03 RELATED SPECIFICATIONS

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the Division 1 - General Requirements specifications are hereby made a part of this Section.
1. Section 27 10 00
2. Section 26 01 00

1.04 RELATED WORK BY OTHERS
- A. Reference Part 3, sub-section 3.01 of this specification.

1.05 RELATED DOCUMENTS
- A. In the event of a conflict between this specification and the construction drawings this specification shall take precedence.

1.06 APPLICABLE CODES & STANDARDS
- A. The Intercommunication and Program System shall comply with the currently adopted versions of the following:
  1. Building Standards Administrative Code, Part 1, Title 24, California Code of Regulations
  2. California Building Code (CBC) Part 2, Title 24, California Code of Regulations (International Building Code, with California Amendments)
  3. California Electrical Code (CEC) Part 3, Title 24, California Code of Regulations (National Electrical Code with California Amendments)
- B. ADA - Americans with Disabilities Act
- C. CAC – California Administrative Code, Title 24

1.07 SUBSTITUTIONS
- A. **This project is an expansion of an existing District Wide System. All equipment installed under this project must be compatible with said existing system. No equipment substitutions shall be accepted.**

1.08 SUBMITTALS
- A. Within thirty-five (35) calendar days after the date of the award of the contract, the Contractor shall submit to the Architect for review, eight (8) copies of a complete Submittal Package. The Submittal Package shall consist of the following sections, with each section separated with index tabs.
  1. Title Page
     a) Project Title
     b) Owner's name
     c) Architect's name
     d) Electrical Engineer's name
     e) Contractor's name
  2. Index of Submittal Contents
     a) Each Section of the Submittal Package shall be numbered chronologically and shall be summarized in the Index.
  3. Certifications
     a) Index of Certification Section Contents
     b) Valid State of California Contractors License
        1) License requirement for this installation shall be C-10 and C-7.
     c) Manufacturer's Certifications
        1) AtlasIED Certified Integrator – Platinum
        2) Trained Technician
  4. Project List
     a) A substantial list (minimum of 5) of completed projects equal in scope to that specified herein. A minimum of (2) of the projects in the list shall be Los Alamitos Unified School District projects.
        1) Contact information shall be made available upon request.
  5. Product Data
     a) Index of Equipment Data Sheets
     b) Manufacturer's Data Sheets including cable types
     c) Applicable Listings and Approvals
  6. Shop Drawings
     a) Shop Drawings shall not be required for this system on this project regardless of notes on the plans.
        1) System Software is existing in the District.
        2) All Data Networking Hardware, Connectors and Cabling shall be provided by the Data Networking Contractor.

PART 2 – PRODUCTS

2.01 SYSTEM COMPONENTS

A. Indoor IP Speaker with integrated Clock
   1. The IP Speaker with integrated Clock for non-talkback applications shall be AtlasIED IP-SDM
      a) Surface wall mount backbox shall be AtlasIED IP-SEA-SD.
      b) Flush wall mount backbox shall be AtlasIED IP-FEST-SD.
         1) Backboxes on all new construction projects shall be flush mount.
B. Indoor IP Speaker with integrated Microphone and Clock
   1. The IP Speaker with integrated Microphone and Clock for talkback applications shall be AtlasIED SDM
      a) Surface wall mount backbox shall be AtlasIED IP-SEA-SD.
      b) Flush wall mount backbox shall be AtlasIED IP-FEST-SD
         1) Backboxes on all new construction projects shall be flush mount.
C. Indoor IP Speaker
   1. The IP Speaker for non-talkback applications shall be AtlasIED SM
      a) Surface wall/ceiling mount backbox shall be AtlasIED IP-SEST-SD
      b) Flush wall/ceiling mount backbox shall be AtlasIED IP-FEST-SD.
         1) Backboxes on all new construction projects shall be flush mount.
         2) Ceiling tile bridge shall be AtlasIED IP-STBE
D. Outdoor IP Speaker
   1. The IP Weatherproof/Vandalproof Speaker shall be AtlasIED IP-HVP
      a) Surface wall mount backbox shall be AtlasIED IP-SEST-HVP
      b) Flush wall mount backbox shall be AtlasIED IP-FEST-HVP.
         1) Backboxes on all new construction projects shall be flush mount.
E. Indoor Analog Extension Speaker
   1. The Analog Extension Speaker shall be AtlasIED SD72
      a) Flush wall/ceiling mount backbox shall be AtlasIED 62-8 with CS95-8 and 81-8R tile bridge.
         1) Backboxes on all new construction projects shall be flush mount.
         2) Ceiling tile bridge shall be AtlasIED 81-8R
F. IP Zone Controllers
   1. The Single Zone IP Zone Controller shall be AtlasIED IP-ZCM

G. IP Scrolling Message Display
   1. The IP LED Display with Integrated Microphone Shall be AtlasIED DM
H. System Cable
   1. **All system cable and connectors shall meet the School District Standards for Data Networking and shall be provided by the Data Networking Contractor and shall comply with the requirements of that specification section.**
I. Outdoor Analog Speakers
   1. The Analog Exterior speakers shall be AtlasIED APF-15TU with VP161A-APF Grill

PART 3- EXECUTION

3.01 DIVISION OF WORK

A. While all work included under this specification is the complete responsibility of the Electrical Contractor, the division of actual work listed following shall occur.
   1. Equipment specific backboxes provided by the system manufacturer shall be provided by System Supplier/Installer and installed by the Electrical Contractor.
   2. The balance of the system, including installation of all other manufacturer's equipment and connection to the data network system, shall be performed by the System Supplier/Installer.

3.02 INSTALLATION

A. All work shall be completed in strict accordance with all applicable codes and ordinances, by a member in good standing of the AtlasIED Certified Integrator Program who has achieved Platinum Status.
B. Cable/Wire
   1. All cable/wire for the system specified herein shall be provided by the data contractor.

3.03 SYSTEM START-UP

A. All start-up programming and system commissioning shall be performed by a manufacturer's trained and certified technician currently employed by the System Supplier/Installer.

3.04 ACCEPTANCE TESTING

A. The system installer shall, in the presence of the Inspector of Record (IOR), perform testing to the satisfaction of the IOR.

3.05 IN SERVICE TRAINING

A. The Contractor shall instruct personnel designated by the District/Owner in the proper use, basic care and maintenance of the system beyond the warranty period. Contractor shall provide up to eight hours of in-service training with this system.

3.06 RECORD DRAWINGS AND CLOSE-OUT DOCUMENTATION

A. System supplier/installer shall periodically update the General Contractor's master set of record drawings kept on site.

B. Contractor shall provide the following at close-out.

1. Three (3) wet signed copies of equipment warranty..

3.07 WARRANTY

A. The System Supplier/Installer shall warrant the equipment and/or materials to be new and free from defects in material and workmanship, and will, within one (1) year from the date of final acceptance, repair or replace any equipment and/or materials found to be defective. This warranty shall not apply to any equipment or materials that have been subject to misuse, abuse, negligence or modification by owner or contractors other than the original installer that provided this warranty.

End of Section

SECTION 27 36 00

Audio Visual System

SECTION 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications apply to work of this Section.

1.02 SCOPE OF WORK

A. The work under this section includes all labor, material, equipment, testing, and accessories required to furnish and install a complete, tested, working Audio Visual Projection and Sound System as indicated on the drawings and as specified herein.

B. It is the intent of the Drawings and Specifications for the Contractor to provide and install a complete, fully operational, and tested system.

C. All miscellaneous system components including, but not limited to, cables, termination equipment, punch blocks, patch panels, backboards, dedicated power provisions, as well as any other related items, shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.

1.03 GENERAL REQUIREMENTS

A. The contractor shall hold a valid State of California C-7 Low-Voltage and C-10 Electrical License, and shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude for at least five years, and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period. Contractor shall be QSC and Extron Certified.

B. The contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.

C. All work shall be performed under the supervision of a company accredited by the basic equipment manufacturer and such accreditation must be presented.

D. The installing contractor shall be a factory authorized distributor and warranty station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The installing contractor shall maintain a spare set of all major parts for the system at all times. All system components shall be 100% backed up with stock at contractors shop.

E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices.

F. If applicable, all of the equipment in this specification shall be furnished and installed with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment shall include any and all updated software revisions. In addition, when the software is available in disk format, a backup copy of the most up to date revision shall be handed to the Owner at the completion of the project.

1.04 QUALITY ASSURANCE

A. In order to maintain a high degree of quality assurance, the contractor shall, without exception, use the parts and supplies as specified in this specification.

1.05 SUBMITTAL AND MANUAL

A. Submittal requirements of this section are:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit eight copies of the complete submission to the Architect for review.

2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.

3. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

4. The second section shall include a copy of the Contractors valid C-7 and C-10 California State Contractors license and letters from Extron and QSC that the company is a fully licensed distributor of the product specified, a list of 20 projects of equal or greater scope, provide copy of Contractors QSC and Extron Training Certificates and a list of proposed instrumentation to be used by the contractor. In addition, provide a written notice guarantying the provision of the requested warranty.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.

6. The fourth section shall contain an original factory data sheet for every component in the specifications.

7. The fifth section shall contain a designation schedule for each device location and complete 1/8" = 1'-0" scale AutoCAD created drawing showing system wiring plans. The Architect / Engineer will provide AutoCAD format drawings of the original associated plans, upon receipt of a written request from the contractor at no charge.

B. Failure to comply with all of the requirements listed above will result in the rejection of the entire submittal package.

C. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following:

1. Instructions necessary for the proper operation and servicing of the system.
2. Complete as-built installation drawings of the system.

3. A schematic diagram of major components and replacement numbers.

1.06 GENERAL SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY

A. Prior to Owner acceptance, the contractor shall provide to Owner, a product and performance warranty.

B. The warranty shall commence from the date of final written acceptance by the Owner.

C. All conditions for obtaining the warranty shall be the sole responsibility of the contractor.

D. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.

1.07 SPECIFIC PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY

A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the Owner.

1.08 ACCEPTABLE MANUFACTURERS

A. Manufacturer of general AV systems and associated equipment shall be: QSC and Extron

B. Its is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications and the equipment's technical data sheets.

C. The functions and features specified are vital to the operation of this facility. Therefore, inclusion of a component's manufacturer in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

D. All basic electronic equipment (not including cable) specified herein shall be produced by a single manufacturer of established reputation and experience who shall have produced similar apparatus for at least three or more years and who shall be able to refer to similar installations rendering satisfactory service.

2.00 PART 2- PRODUCTS

A. Video Management- Extron DTP Crosspoint 108 4k IPCP Q MA70 with Link License. With all associated HDMI Transmitters and Recievers as required for fully operational system.

1. Control by use of multiple TLP PRO 1025m

B. Audio Management- QSC Q-Sys Platform utiliziong Core 110F Controller.

1. Control by use of mulitiple TSC-101-G3
2. Amplifiers to be QSC Q-Sys CX-Q8K8
3. Speakers to be QSC AP-5122, Q-Sys PL-DC12 and Q-Sys PL-Sub15.
4. Wireless Microphone system- Shure ULDX. Provide 1 Body pack and 3 hand held wireless microphones

C. Assistive Listening- Williams T-55 Transmitter base station with Antennae.

1. Provide Min. of 100 R37N Recievers and Min. 25 Neckloops.
2. Provide all required ADA signage.

D. Projection- Epson Pro L1200U WUXXGA 3LCD Projector with 4K with Lens.

E. Screens- Draper Access XL E Screen
1. Image Format HDTV
2. 133” X 236” (diagonal 270”)

2.01 Functions

A. A Fire alarm relay shall be installed to cause a complete system Mute of all video and audio functions.
B. Any video input can be routed individually or together to any output.
C. Any Audio, either audio directly, or from video, may be routed to gym seating speakers, or center cluster speakers as user selection.
D. Projectors and monitors On/Off, and Screen Control shall be all controlled via the Crosspoint Media Matrix Controller
E. Any Audio being presented to any speakers, shall be routed also to Assistive Listening system.
F. Contractor shall hold a pre programming meeting with all stakeholders, prior to programming, to achieve functions and capabilities of District needs.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. It shall be the responsibility of the factory-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.

B. Furnish all conduit, junction boxes, conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

C. The cables within racks or cabinets shall be carefully cabled and laced with no. 12 Cord waxed linen lacing twine or ty-raps.
D. Splices of conductors in underground pull boxes are not permitted.

E. The labor employed by the contractor shall be regularly employed in the installation and repair of the specified systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.

F. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., The contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., Caused by the performance of this work.

G. The system must meet all local and other prevailing codes.

H. All cabling installations shall be performed by qualified technicians.

I. Contractor shall install network drop for panel from existing IDF/MDF for communications, and provide all necessary programming to connect to districts Network and Control software.

J. In order to ensure proper terminations, it is required that all cables shall be stripped using a special tool approved by the manufacturer of the cable / terminating device.

K. The use of lubricants (i.e. Yellow 77) to facilitate the installation of cables in conduits is highly discouraged. If such a lubricant must be used, the contractor shall verify the acceptability of the lubricant to be used with the cable manufacturer, prior to using such a lubricant.

L. Under no circumstance are "channel locks" or other pliers to be used.

M. Cable may be run exposed above ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The cables shall not be laid directly on the ceiling panels. The use of cable ties shall be done in accordance with the cable manufacturer's requirements. The cable jacket composition must meet local and all other prevailing fire and safety codes.

N. All firewalls penetrated by system cabling shall be sealed by use a non-permanent fire blanket or other method in compliance with the current edition of National Fire Protection Association (NFPA) and the National Electric Code (NEC) or other prevailing code. The contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area.

O. Contractor shall connect system to District Network.

P. Materials shall be installed in strict compliance with local building codes. All work shall be performed in accordance with the Extron and QSC instructions and in a manner satisfactory to the owner's representative.

Q. The installer shall be fully qualified and factory trained by Extron and QSC, Inc. in the installation, operation, and programming of the system.

R. System shall be, with out exception, be installed in a individual exact point identification fashion. This means that each and every point to be annunciated and reported as to its exact device.

3.2 GENERAL TESTING REQUIREMENTS

A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds.

B. System shall be complete and properly operating prior to calling for the test. The inspector, contractor and engineer shall walk test system at district's option and contractor shall make minor satisfactory adjustments to the system in the presence of the inspector. Contractor shall coordinate the time of test with the district inspector. This test shall be performed during a time when there are no other persons on the site.

C. Provide two portable radio transceivers to be used when walk testing the system. The transceivers shall be capable of communication throughout the entire site.

3.03 FINAL ACCEPTANCE

A. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.

B. The Owner or Owner's representative will conduct a final job review once the contractor has finished the job. This review will take place within one week after the contractor notifies the owner.

C. Two copies of all as-built drawings for all identifications shall be provided to the Owner before the owner's review.

D. The Owner or Owner's representative will review the installation and drawings prior to the system acceptance.

E. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct.

F. In the event that repairs or adjustments are necessary, the contractor shall make these repairs at his own expense. All repairs shall be completed within 10 days from the time they are discovered.

G. The contractor shall provide not less than eight (8) hours for site instruction of personnel in the operation and maintenance of the installed systems. This instruction time shall be divided as directed by the Owner.

END OF SECTION

SECTION 28 13 16
SECURITY AND DATABASE MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the S2 Security Corporation System. Security and Database Management System (SMS) consisting of computer hardware, software, and associated licensing and equipment for monitoring, recording, and managing Electronic Access Control System (EACS) and Integrated Systems (IS) data and functionality.

B. The SMS shall meet the requirements of business and government access control systems. The system shall monitor and control facility access, and shall perform alarm monitoring, camera and video monitoring (when integrated with a compatible integrated Video Monitoring System), communications loss monitoring, and temperature monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.

C. The SMS includes the following sub-components:

1. Operating Systems (OS) software and firmware

2. Application Software

3. Database Software

4. Network connected Security Management Servers

5. Network connected field level panels

D. The SMS shall be integrated with monitoring and control systems

1.2 DEFINITIONS

A. API: Application Programming Interface
B. AVI: Audio Video Interleave
C. CA: Certificate Authority
D. CAC: Common Access Card
E. CE: European Union Conformity
F. CPU: Central Processing Unit
G. CSV: Comma Separated Values
H. DNS: Domain Name Server
I. DSM: Door Status Monitor
J. DVR: Digital Video Recorder
K. EACS: Electronic Access Control System
L. FCC: Federal Communications Commission
M. FIPS: Federal Information Processing Standard

N. FIFO: First In – First Out
O. FTP: File Transfer Protocol
P. FRAC: First Responder Authentication Credential
Q. GB: Gigabyte
R. GSOC: Global Security Operations Center
S. HA: High Availability
T. HTML: Hypertext Markup Language
U. H.264: Video Compression Standard
V. I^2C: Inter-Integrated Circuit
W. IEEE: Institute of Electrical and Electronics Engineers
X. I/O: Input / Output
Y. IP: Internet Protocol
Z. IS: Integrated System
AA. JPEG: Joint Photographic Experts Group
BB. LAN: Local Area Network
CC. LDAP: Lightweight Directory Access Protocol
DD. MB: Megabyte
EE. MJPEG: Motion JPEG
FF. MSATA: Mini-Serial Advanced Technology Attachment
GG. MSP: Mobile Security Professional
HH. MTBF: Mean-Time Between Failure
II. NAS: Network Attached Storage
JJ. NAT: Network Address Translation
KK. NBAPI: NetBox Application Programming Interface
LL. NECA: National Electric Code Association
MM. NFPA: National Fire Protection Association
NN. NVR: Network Video Recorder
OO. ODBC: Open Database Connectivity
PP. OS: Operating System
QQ. OVID: Open Video Integration Driver
RR. PDF: Portable Document Format
SS. PIN: Personal Identification Number
TT. PIV: Personal Identity Verification
UU. PoE: Power over Ethernet
VV. PTZ: Pan-Tilt-Zoom
WW. RAID: Redundant Array of Independent Disks
XX. RAM: Random Access Memory
YY. REX: Request to Exit
ZZ. RFID: Radio Frequency Identification
AAA. RoHS: Restriction of Hazardous Substances
BBB. ROM: Read Only Memory
CCC. RU: Rack Unit
DDD. SFTP: Secure File Transfer Protocol
EEE. SHA: Secure Hash Algorithm
FFF. SIO: Serial Input / Output
GGG. SLA: Sealed Lead-Acid
HHH. SMS: Security Management System or Short Message Service (text messaging)
III. SSL: Secure Sockets Layer
JJJ. SUSP: Software Upgrade and Support Plan
KKK. TCP: Transmission control protocol - connects hosts on the Internet
LLL. TIA: Telecommunications Industry Association
MMM. TLS: Transport Layer Security
NNN. TWIC: Transportation Worker Identification Credential
OOO. UI: User Interface
PPP. UPS: Uninterruptible Power Supply

QQQ. UTP: Unshielded Twisted Pair
RRR. VMS: Video Management System
SSS. WAN: Wide Area Network
TTT. Wi-Fi: Wireless Network

1.3 PERFORMANCE REQUIREMENTS

A. The S2 SMS shall be certified to meet the following standards:

1. ISO 9000

2. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing as stated in the Environmental Design of Electrical Equipment Act (EDEE)

3. 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

4. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”

5. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”

6. Electronic data exchange between Video Surveillance System and an Access Control System shall comply with SIA TVAC

7. Installation shall comply with FCC CFR 47 Part 15 Class A "Telecommunications, Radio Frequency, Digital Device Emission”

8. Installation shall comply with federal, state, and local codes and Authority Having Jurisdiction (AHJ)

1.4 ACTION SUBMITTALS

A. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.

B. Shop Drawings: Include system line diagrams, equipment locations, installation details, and system integration plans.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types, quantities, and sizes.

3. Plans and Elevations: Dimensioned plans and elevations of equipment racks, enclosures, and conduit interconnections, including access and workspace requirements.

4. Data Calculations: Provide data bandwidth and storage calculations, including data backup and archive configuration details meeting the minimum project requirements as described herein.

5. Power and Heat Load Calculations: Provide power and heat load calculations for all hardware, including UPS capacity calculations.

6. Wiring Diagrams: For power and signal wiring.

C. Equipment and Software List: Include every piece of equipment and software by product/model name and/or number, manufacturer, serial number, revision number, location, and date of original installation. If factory and/or bench testing regimens are required by the project plan, add pretesting record of each piece of equipment and software, listing name of person testing, date of test, and adjustments made.

1.5 INFORMATIONAL SUBMITTALS

A. ISO9000 Listing Certificates

B. CE and FCC Compliance Certificates:

C. Field quality-control reports

D. Current S2 Security Integrator Certification Letter

E. Current S2 Security Training Certificates (listing expiration dates) for two (2) technicians from the supporting office

F. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner

1.6 CONTRACTOR REQUIREMENTS

A. The Contractor shall have a supporting office within fifty (100) miles of the project location

B. Certifications: Two (2) technicians from the supporting office shall hold current certifications with S2 Security

C. On-site maintenance and repair service shall be available locally and within four (4) hours of notification of condition

D. On-site Contractor personnel shall hold all required local, state, and federal licenses

E. On-site Contractor personnel shall hold current certifications with S2 Security

F. The Contractor shall provide three (3) references for completed projects of similar scope

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For all components and software to include in emergency, operation, and maintenance manuals.

1. Extra Materials:

    a. Return all left-over (unused) product and materials to the Owner

2. Applicable operating system, database, client, and application software on portable storage media

3. Full System Backup as of closeout date on portable storage media

4. Submit one (1) printed and one (1) electronic copy of project binder in final form. This copy shall contain as a minimum:

    a. Table of Contents for each element

    b. Contractor information - names phone numbers, and email for sales, technical support, and consumables reordering

    c. Lists of spare parts and replacement components recommended to be stored at the site for ready access

    d. Datasheets for all equipment

    e. Operation and maintenance manuals for all equipment

    f. Operation and maintenance procedures not covered in manufacture's manuals

    g. Training:
        1) Program Syllabus.
        2) Manual(s) and Material(s).

1.8 QUALITY ASSURANCE

A. Installation shall comply with federal, state, and local codes and Authority Having Jurisdiction (AHJ).

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. All software and hardware shall be programmed and installed in accordance with manufacturer's specifications.

D. All equipment shall be new, in current production, and the standard products of a manufacturer of ESS equipment.

E. Manufacturer shall guarantee availability of parts, for a minimum of seven (7) years from date of shipment.

F. On-site maintenance and repair service shall be available locally and within <four (4) hours> of notification of condition.

G. Contractor shall review drawings and specifications.

H. Software integration between all integrated systems shall be tested and certified for interoperability by the manufacturer of each system.

I. Software integration between the SMS, VMS, and all other integrated system components shall be tested and certified for interoperability by the manufacturers of each system.

1.9 PERMITS

A. All permits required for the specified performance and completion of the work shall be secured by the Contractor

1.10 PROJECT CONDITIONS

A. Environmental Conditions: System components shall withstand the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior Environmentally Controlled Space: Rated for continuous operation in ambient temperatures of 32° to 95° F (0° to 35° C) dry bulb and a relative humidity of 20 to 80 percent, noncondensing.

1.11 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to service, repair or replace system components as needed for proper system operation as specified herein.

B. Warranty Period: a 2-year warranty on hardware and a 1-year warranty on labor and software from date of date of Owner Acceptance.

PART 2 - PRODUCTS

2.1 OPERATIONAL REQUIREMENTS

A. The SMS shall be implemented through network appliance architecture with a three-tier modular hardware hierarchy and embedded three-tier software architecture.

1. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.

2. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.

3. Security of the data communicated over the network to and from the browser, Network Controller, and field panels shall be protected by TLS protocol encryption. The connection shall use TLSv1.2, GCM mode and a 2048-bit RSA key.

4. The top hardware tier shall be the Network Controller. Embedded on the Network Controller shall be an operating system, a web server, security application software, and the database of personnel and system activity. Converged Video Access systems shall also include fully functional network video recorder.

5. The middle hardware tier shall be the Network Node. The Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Network Controller and Application Blades connected to the system's inputs, outputs, and readers. This modular design shall make it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs shall be automatically re-integrated.

6. The bottom hardware tier shall be the Application Blades. Four unique Application Blades shall be available:

    a. Access Control Blade: shall support two readers, four supervised inputs, and four relay outputs.

    b. Alarm Input Blade: shall support eight supervised inputs.

    c. Relay Output Blade: shall support eight relay outputs.

    d. Temperature Blade: shall support eight analog temperature sensor inputs.

B. The SMS shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.

1. The database tier shall use PostgreSQL. PostgreSQL is a full featured, high performance database management system that supports ODBC. This shall provide a small footprint, low administration, and a high reliability relational database that is embedded without requiring the use of a separate PC server.

2. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.

3. The security application software tier contains the business logic. This application shall also be embedded on the Network Controller and requires no additional memory or processing power.

4. This three-tiered embedded software design runs within an embedded Linux Ubuntu 16.04 LTS operating system and shall require no client-side software other than a web browser.

C. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

D. All S2 systems and components shall have been thoroughly tested and proven in actual use.

2.2 FUNCTIONAL REQUIREMENTS

A. The system shall support the S2 Global® product offering. S2 Global is a global security operations center (GSOC) application enabling system operators and administrators to monitor and control multiple distributed S2 NetBox installations simultaneously. The Network Controller can be configured to use Network Address Translation (NAT) to communicate with an S2 Global system.

B. The system shall support the S2 High Availability (HA) Solution. The HA Solution includes an HA server pair consisting of two S2 NetBox Enterprise 100 servers running Stratus Technologies everRun® Express high availability virtualization software. The servers act as a platform for the S2 software and operating system as a virtual machine on one server, which is continually backed up on the other server.

C. Widget Desktop: The SMS shall provide a widget-based user interface that enables users to create custom monitoring layouts by selecting and arranging widgets on a desktop.

1. Each widget shall provide easy access to a frequently used function—allowing users to, for example, view an Activity Log, a camera view, or real-time web content.

2. System administrators can save custom layouts for subsequent call up by users, who can then arrange the widgets as desired on their desktops. The administrator shall determine which widgets are available in a layout and the extent to which users can customize the layout. Setup privileges shall enable administrators to switch from “Compose Mode” to “Monitoring Mode” from the desktop menu.

3. When composing layouts, system administrators shall have the ability to display a grid overlay on the Widget Desktop background. Whenever a widget is moved or resized, it will align with (or “snap to”) the nearest intersection of lines in the grid. If the grid is saved with the layout, it will appear in the background when users view the layout.

4. The widgets that shall be available for layouts are: Activity Log, Alarm Workflow, Auto-Monitor, Camera View, Clock, Duty Log Entry, Elevator Status, Events, Explorer, Floorplans, Intrusion Panel, Passback Grace, Photo ID History, Portal Status, Portal Unlock, Statistics Block, Status, and Threat Level.

D. System Partitioning: The system administrator shall have the ability to divide the SMS into partitions, allowing subsets of the overall population and/or resources to be managed separately.

1. From the default Master partition, one or more additional partitions can be created.

2. Each partition shall contain some number of administrators, card holders with their credentials and resources.

3. When performing administrative functions, the administrator of a partition shall have the ability to affect only the cardholders and resources in that partition. However, resources can be shared across partitions through the access level assignments in another partition.

4. System partitioning shall have a precision feature that allows administrators in one or more partitions to view and perform edit functions on person records that belong to another partition.

5. Administrators shall have the ability to search for person records across all partitions to which they have access. The system administrator shall have the ability to make such cross-partition searches the default for users who have access to multiple partitions.

6. After finding a person record located in another partition, an administrator shall be able to click a button to switch to that partition directly from the person record—and possibly edit the record, depending on his or her access rights in that partition. Alternatively, provide the option for making every person record seamlessly visible across all partitions.

E. The SMS shall provide the following Access Control capabilities:

1. Login throttling, which can be enabled for the system to limit the number of login attempts from the same IP address for a selectable duration.
2. Integrated photo ID creation capability.
3. Photo ID and video verification during access control monitoring.
4. User interface secured access under encrypted password control.
5. System-wide timed anti-passback function.
6. Regional anti-passback with mustering and roll call functions.
7. Region occupancy counting and control.
8. “First-in-unlock” rule enforcement.
9. Multiple access levels and cards per person.
10. 128-bit card support for Wiegand card readers.
11. Detailed time specifications.
12. Simultaneous support for multiple card data formats.
13. Elevator control with or without floor selection tracking.
14. Access privileges variable by threat level.
15. Scheduled portal unlocks by time and threat level.
16. Card Format Decoder to quickly discover unknown card formats.
17. Card enrollment by reader or keyboard.
18. Compatibility with various input devices, including biometric readers.
19. Activation/expiration date/time by person with one-minute resolution.
20. Access level disable for immediate lockdown.
21. Use of Threat Levels to alter security system behavior globally.
22. Duress PINs, which can be enabled for the system to allow a valid user to raise an alarm if compelled under duress to use his or her credentials (card and PIN) to allow access for another person.
23. Multiple holiday schedules.
24. Timed unlock schedules.
25. Scheduled actions for arming inputs, activating outputs, and locking and unlocking portals.

26. Optional two-man access restriction for portals, requiring two valid card reads from two separate cardholders within a specified amount of time for portal entry.

27. Card enrollment reader support.

28. Dual-reader portal support.

29. Wiegand Reader support.

30. Magnetic-stripe reader support with cards using ABA Track 2 format for up to 200 bits.

31. Wiegand keypad PIN support for 4-digit or 6-digit PINs.

32. 8-bit and 4-bit burst keypad support for 4-digit or 6-digit PINs.

33. Integration with supported alarm panels.

34. Support for up to 200 DMP and 255 BOSCH intrusion panels with high-level TCP/IP integration.

35. Optional storage and recall of ID photos and personal/emergency data.

36. Unlimited person records.

37. Up to 150,000 credentials are stored locally at the Network Node. An unlimited number of credentials may be authenticated with the Network Controller, caching up to 150,000 of the most frequently used credentials on the Network Node. In an instance where the credential is not stored locally at the Network Node, the Network Node will attempt to confirm access by verifying the existence of the credential with the Network Controller.

38. Unlimited number of scheduled actions, with the Network Controller downloading up to 16 per Network Node per day of the soonest-to-activate actions applying to that Network Node, with any others that remain in the database as candidates for downloading later. Expired scheduled actions are removed automatically.

39. The system shall support tracing a person's activity in the current partition if the "Trace this person" check box is selected on the person record.

40. Search for person records using a credential scan.

F. The SMS shall provide the following Monitoring capabilities:

1. The Monitoring Home page shall allow users to view a full system summary, including the Activity Log, Auto-Monitor, and links to frequent User Tasks.

2. Common alarm panel integration for disarm on access, and arm on egress.

3. Support for the direct viewing of IP cameras.

4. Integrated real-time IP-based S2 NetVR® systems and compatible third-party NVR systems with stored video replay for events.

5. Provides alarms on video loss, video motion detection, and video restore events.

6. Virtual inputs for video fail, camera normal, video motion, and building occupancy limits exceeded.

7. Provides alarms on communication loss and temperature variation.

8. Support for the creation of custom sets of alarm event actions.

9. Provides the ability to record video and link to video for alarm events based on access control activity.

10. Available video control and playback through the SMS user interface.

11. Provides the ability to assign threat levels to various alarm events according to severity.

12. Provides the ability to select up to 20 levels of priority for event actions.

13. Provides the ability to enter a duty log comment into the Activity Log, or to append a unique or preset comment to a particular log entry while viewing the Activity Log.

14. Support for the display of Activity Log entries that include both the time the event occurred on the Network Node and the time it was reported to the Network Controller.

15. Support for electronic supervision of alarm inputs.

16. Support for the use of output relays for enabling circuits under alarm event control.

17. A monitoring desktop that integrates video, system Activity Logs, floorplans, ID photos, threat level control, and alarm notifications.

18. Support for the creation of unlimited customized monitoring layouts through the use of widgets, including layouts sized for the iPad or MacBook Air.

19. Graphic floorplans with active icons of security system resources.

20. System user permissions to grant whole or partial access to system resources, commands, and personal data.

21. Secure access to the user interface under encrypted password control.

22. Delivery of alerts via browsers, email, and text messages.

23. Remote Logging of system messages to remote host.

24. System health and maintenance:

    a. Provides the ability to manage system health alerts generated by the SMS when it detects error conditions at applicable health monitoring points.

    b. For a given system, the health monitoring points may include the system license, disks, RAID drives, FTP, NAS, Backup, Archive, Disk Usage, and VMS.

    c. If a user configures notifications for a selected email group, group members shall receive a message whenever an error condition is detected at a health monitoring

point. If the user has chosen to include a health summary, each notification shall include status information for all of the system's health monitoring points.

G. The SMS shall provide the following Video Management capabilities:

1. Real-time video monitoring displays, including multiple cameras simultaneously.
2. Pan, Tilt, and Zoom control of capable cameras.
3. Playback of video and access control event-related video.
4. Video switching and video widget pop-ups based on access activity or event activation.
5. Integrated alarm inputs from the Video Management System (VMS).
6. Digital playback of video events.
7. Linking of video and events based on triggers provided by the SMS or VMS.
8. Support for multiple DVR and NVR systems.
9. Multiple pre-programmed supported cameras.
10. Recall of photo ID and real-time video feed for video verification and comparison of card holder.
11. Monitoring and control through a web browser interface.
12. System user permissions to grant whole or partial access to system cameras and video resources.
13. Full integrated operation with S2 Magic Monitor® for live, recorded, forensic and life safety notification over existing TV's and Monitors.
14. Ability to use the SMS web interface to review the status of system and storage drives, and to adopt physical and virtual drives into S2 NetVR so it can begin using them for video storage.

H. The SMS shall provide the following Security Database capabilities:

1. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.
2. Partitions: It shall be possible to partition the system to create independent, virtual security management systems for multiple populations.
3. Support for the sharing of user privileges across partitions in a system.
4. Support for the grouping of multiple access levels across partitions in a system.
5. Built-in Open Database Connectivity (ODBC) compliant database for personal data.

6. LDAP, SLDAP, and Microsoft Active Directory integration for single-user logon authentication.

7. Microsoft Active Directory integration to allow the synchronization of cardholder data between Active Directory servers and the SMS.

8. Unlimited person records.

9. Network-secure API for external application integration.

10. Extensive and easy to use custom report generator.

11. User-defined data fields in personnel records.

12. Record recall by vehicle tag, name, or card.

13. An API for adding to, deleting from, and modifying the database.

14. Storage of system user passwords and permissions.

15. Storage and recall of ID photos and emergency personal information.

16. Pre-defined reports on system configuration, system activity history, and people.

17. A Used By feature for listing all correlations between specific card readers, keypads, inputs, and outputs, against groups, portals, elevators, access levels, access level groups, and other configured access control features. This feature may be useful for quickly determining I/O associations when editing and/or deleting system I/O points.

18. An Audit Trail report that shows changes made to the security database over a specified period of time.

    a. For each transaction listed in the report results, information is available on when the transaction occurred, who made the changes, the fields that were modified, and the original and new values.

    b. Search criteria can be applied to filter the report results, either by the person whose record was changed or by the area of the system configuration that was modified.

19. A Credential Audit report that shows all existing access cards by their current status settings and provides the ability to search for cards that have not been used for an operator-entered number of days. The report also shows for each card the name of the person to whom it was issued and the card number.

20. A Duty Log report shows duty log comments residing in the current security database, including archives.

    a. For each duty log comment included in the report results, information is available on when the comment was entered, who entered it, the date and time of the logged event associated with the comment, the name of the logged event, and the specific comment text.

    b. Search criteria can be applied to filter the report results, either by Operator (the user who entered the duty log comment) or by Event type.

21. Custom report writer interface that allows the interactive creation of custom reports. Reports may be saved for later reuse. No third party software (such as Crystal Reports) shall be necessary.

22. Custom report scheduling and distribution of report via email.

23. Selectable custom report output formats, including PDF, CSV, and HTML (default).

24. Custom report repository location. Users shall be able to review, cancel and delete reports from this data storage location.

25. Seamless search capability for access history reports. The reporting function shall search the database and archive simultaneously for matching report parameters.

26. Column sorting. Custom reports output shall be user configurable to sort individual columns in both ascending and descending order.

27. Periodic backup to on-board flash ROM and optional Network Attached Storage (NAS), or including FTP / SFTP servers.

28. Periodic archive creation for historical custom reporting and improved on-board database performance.

29. Email and text messaging (SMS) alert notifications.

30. Custom Menu capabilities allowing a user to create a custom menu containing a specific set of options, which can be assigned to users and will then appear in their navigation palettes.

2.3 HARDWARE REQUIREMENTS

A. The SMS shall employ a modular hardware concept that enables simple system expansion and utilizes a three-tiered hardware hierarchy:

1. At the top tier is the Network controller, which shall contain the database engine, web server, application software, and configuration data. It is at this level that System Users, through a browser interface, shall interact with the SMS, set configurations, monitor activities, run reports, manage alarms, and manage cameras and video and storage.

2. At the second tier is the Network Node, an intelligent device with native TCP/IP support, which shall make and manage access control decisions.

3. At the third tier are the application extension blades. Each of these blades shall connect to and manage a set of inputs, outputs, readers, or temperature monitoring points.

4. The Network Controllers and Network Nodes shall run on existing building TCP/IP networks and shall be configurable for access from separate subnets, through gateways and routers and from the Internet.

5. An S2 MicroNode® Plus, which combines an Access Control blade and a Network Node, shall also be available.

B. The Network Controller shall contain the operating system, database engine, web server, application software, and configuration data. The Network Controller shall be available in four

configurations to support small to medium, large, and ultra-large systems. Those systems shall be identified as a solid-state S2 NetBox Network Controller, a solid-state S2 NetBox Extreme Network Controller, an S2 NetBox Enterprise 50 Network Controller, and an S2 NetBox Enterprise 100 Network Controller.

C. A solid-state S2 NetBox Network Controller shall contain a processor, flash memory, and a network switch. The Network Controller shall be supplied with 12V DC at a minimum of 5 amps. Internal battery backup shall supply sufficient power to provide for an orderly shutdown of the system in case of loss of external power. External battery backup shall be used to provide uninterrupted operation in the event of external power loss. The Network Controller is accompanied by a Network Node. The Network Node shall contain I^2C for communication with the Application Blades and a network interface port. A solid-state Network Controller shall have the following capabilities:

1.	OS	Linux Ubuntu 16.04 LTS
2.	Storage	20GB MSATA(minimum)
3.	Processor	Intel N2800 1.86GHz 2 Cores 4 Threads
4.	Memory (RAM)	2GB
5.	Ethernet Ports	1
6.	Certifications/Compliances	UL, CE, FCC Part 15, RoHS
7.	Warranty	2 years hardware, 1 year software
8.	Dimensions (H, W, D)	17in x 17.5in x 8.25in (432mm x 445mm x 210mm)
9.	Weight	10 lbs. (4.54 kg) (minimum configuration)
10.	Operation Temperature	32 to 95 F (0° to 35° C)
11.	Storage Temperature	-4 – 158 F (-20° to 70° C)
12.	Relative Humidity	5-90%
13.	MTBF	213447 hours
14.	AC Input	86-264 VAC 47-440 Hz 1.5A max @ 115VAC
15.	BTU/h	256
16.	Network Nodes / MicroNodes	32
17.	Access control portals	32
18.	Access cards	20,000
19.	Card formats	64 per Network Node (32 active)
20.	Alarm input points	500
21.	Control point outputs	500
22.	Temperature monitor points	500
23.	Elevators	14 per Network Node
24.	Floors	52 per Network Node
25.	Online event history log:	up to 10 million records
26.	Ethernet ports	1
27.	Time specifications	512 per Network Node
28.	Time spec groups	512 per Network Node
29.	Time specs per group	8
30.	Threat Levels	8 per Network Node
31.	Threat Level Groups	32 per Network Node
32.	Holidays	30 per Network Node
33.	Access levels	512 per Network Node
34.	Access levels per person	32 per Network Node
35.	Unique user roles	Unlimited
36.	Credentials per person	No limit per Network Node
37.	Report Groups	50
38.	Camera Groups	50
39.	Concurrent system users	5

D. The S2 NetBox Extreme Network Controller shall be available in wall-mount or 2RU rack-mount enclosure. It shall contain a motherboard with an Intel® Atom™ processor and solid-state disk drive. An Ethernet connector shall be provided for network connection. The S2 NetBox Extreme Network Controller shall have the following capabilities:

1.	OS	Linux Ubuntu 16.04 LTS
2.	Storage	20GB MSATA
3.	Processor	Intel N2800 1.86 GHz 2 Cores 4 Threads
4.	Memory (RAM)	2GB
5.	Ethernet Ports	1
6.	Certifications/Compliances	UL, CE, FCC Part 15, RoHS
7.	Warranty	2 years hardware, 1 year software
8.	Dimensions (H, W, D)	Wall Mount: 13in x 10.5in x 3.57in (330mm x 267mm x 91mm) Rack Mount: 2U rack x 12" (305 mm) D
9.	Weight	9.7 lbs (4.4 kg)
10.	Operation Temperature	32° to 95° F (0° to 35° C)
11.	Storage Temperature	-4° to 158° F (-20° to 70° C)
12.	Relative Humidity	5-90% non-condensing
13.	MTBF	213447 hours
14.	AC Input	86-264 VAC 47-440 Hz 1.5A max @ 115VAC
15.	BTU/h	256
16.	Network Nodes / MicroNodes	64
17.	Access control portals	128
18.	Access cards	40,000
19.	Card formats	64 per Network Node (32 active)
20.	Concurrent system users	10
21.	Alarm input points	2000
22.	Control point outputs	2000
23.	Temperature monitor points:	500
24.	Elevators	14 per Network Node
25.	Floors	52 per Network Node
26.	Online event history log:	up to 40 Million records
27.	Ethernet ports:	1
28.	Time specifications	512 per Network Node
29.	Time spec groups	512 per Network Node
30.	Time specs per group	8
31.	Threat Levels	8 per Network Node
32.	Threat Level Groups	32 per Network Node
33.	Holidays	30 per Network Node
34.	Access levels	512 per Network Node
35.	Access levels per person	32 per Network Node
36.	Unique user roles	Unlimited
37.	Credentials per person	No limit per Network Node
38.	Report Groups	50
39.	Camera Groups	50

E. The S2 Enterprise 50 Network Controller shall consist of a 1RU rack-mounted controller with additional processing power, memory and solid-state disk drive. The S2 Enterprise 50 Network Controller shall have the following capabilities:

1.	OS	Linux Ubuntu 16.04 LTS
2.	Storage	1 (128GB) SSD

3.	Processor	Intel Pentium G850
4.	Memory (RAM)	4GB
5.	Ethernet Ports	1
6.	Certifications/Compliances	UL, CE, FCC Part 15, RoHS
7.	Warranty	2 years hardware, 1 year software
8.	Dimensions (H, W, D)	1.67in x 17.25in x 21.8in (4.24cm x 43.82cm x 55.37cm)
9.	Weight	18 lbs. (8.17 kg)
10.	Operation Temperature	50° to 95° F (10° to 35° C)
11.	Storage Temperature	-40° to 158° F (-40° to 70° C)
12.	Relative Humidity	5-90% non-condensing
13.	MTBF	172199 hours
14.	AC Input	100-240VAC, 50/60Hz
15.	BTU/h	948
16.	Network Nodes / MicroNodes	128
17.	Access control portals	1792
18.	Access cards	Unlimited
19.	Card formats	64 per Network Node (32 active)
20.	Concurrent system users	25
21.	Alarm input points	2000
22.	Control point outputs	2000
23.	Temperature monitor points	500
24.	Elevators	14 per Network Node
25.	Floors	52 per Network Node
26.	Online event history log	Up to 160 million records
27.	Ethernet ports:	1
28.	Time specifications	512 per Network Node
29.	Time spec groups	512 per Network Node
30.	Time specs per group	8
31.	Threat Levels	8 per Network Node
32.	Threat Level Groups	32 per Network Node
33.	Holidays	30 per Network Node
34.	Access levels	512 per Network Node
35.	Access levels per person	32 per Network Node
36.	Unique user roles	Unlimited
37.	Credentials per person	No limit per Network Node
38.	Report Groups	50
39.	Camera Groups	50

F. The S2 Enterprise 100 Network Controller shall consist of a 1RU rack-mounted controller with additional processing power and memory, RAID-1 solid state disk drive array, serial port and network connections. The Exacta100 Network Controller shall have the following capabilities:

1.	OS	Linux Ubuntu 16.04 LTS
2.	Storage	2 (128 GB) SSD’s configured RAID-1
3.	Processor	Intel E3-1220v2 3.1 GHz 4 cores 4 threads
4.	Memory (RAM)	8GB
5.	Ethernet Ports	1
6.	Certifications/Compliances	UL, CE, FCC Part 15, RoHS
7.	Warranty	2 years hardware, 1 year software
8.	Dimensions (H, W, D)	1.67in x 17.25in x 21.8in (4.24cm x 43.82cm x 55.37cm)
9.	Weight	18 lbs (8.17 kg)
10.	Operation Temperature	50° to 95° F (10° to 35° C)

11.	Storage Temperature	-40° to 158° F (-40° to 70° C)
12.	Relative Humidity	5-90% non-condensing
13.	MTBF	172199
14.	AC Input	90 - 264 VRMS 47/63Hz 6/3 A
15.	BTU/h	1327
16.	Network Nodes / MicroNodes	512
17.	Access control portals	7168
18.	Access cards	Unlimited
19.	Card formats	64 per Network Node (32 active)
20.	Concurrent system users	35
21.	Alarm input points	2000
22.	Control point outputs	2000
23.	Temperature monitor points:	500
24.	Elevators	14 per Network Node
25.	Floors	52 per Network Node
26.	Online event history log:	Up to 400 million records
27.	Ethernet switch ports:	1
28.	Time specifications	512 per Network Node
29.	Time spec groups	512 per Network Node
30.	Time specs per group	8
31.	Threat Levels	8 per Network Node
32.	Threat Level Groups	32 per Network Node
33.	Holidays	30 per Network Node
34.	Access levels	512 per Network Node
35.	Access levels per person	32 per Network Node
36.	Unique user roles	Unlimited
37.	Credentials per person	No limit per Network Node
38.	Report Groups	50
39.	Camera Groups	50

G. S2 NetBox VR Hardware Specifications:

1. Access Control

a.	Cardholders	60,000
b.	Access levels	512 per Network Node
c.	Time specs	512 per Network Node
d.	Simultaneous users	5
e.	Readers (per enclosure)	14
f.	Portals	32
g.	Inputs / Outputs	512
h.	Network Nodes / MicroNodes	32
i.	Elevators	14 per Network Node
j.	Floors	52 per Network Node

2. Video Management

a.	Max IP Camera Streams	16
b.	IP Camera Resolution	IP camera dependent
c.	IP Camera Frame Rate	IP camera dependent
d.	Compression type	MJPEG, H.264

3. Platform

a.	Max Storage (internal)	4.0TB
b.	Storage Configuration	JBOD
c.	Processor	Intel i3
d.	Memory (RAM)	4GB DDR3

e.	OS	Linux Ubuntu 16.04 LTS
f.	OS/Application Storage	150GB SSD
g.	NIC (10/100/1000)	2
h.	Sustained Hard Drive Throughput	100Mbps
i.	Certifications / Compliances	UL, CE, FCC, RoHS
j.	Warranty	2 years hardware
k.	Chassis	2U
l.	Dimensions (H, W, D)	3.5in x 19.0in x 14.58in (8.89cm x 48.26cm x 37.03mm)
m.	Weight	12lbs (5Kg)
n.	Operation Temperature	32° - 120.2°F (0° - 49°C)
o.	Storage Temperature	-40° - 158°F (-40° - 70°C)
p.	Operating Environment	Humidity 85%, non-condensing
q.	AC Input	90 - 264 VAC, 47/63 Hz, 5A/3A
r.	MTBF	107,071 hours
s.	BTU/h	938

4. Minimum Client Requirements

a.	Operating System	Microsoft Windows 7 Microsoft Windows 10 Mac OS X Yosemite (10) Mac OS X El Capitan (11)
b.	Browser	Internet Explorer 11 Chrome 70 Firefox 63 Safari 8, 9
c.	Processor	Intel Core i3
d.	Memory (RAM)	4GB
e.	Hard Drive	100GB

H. S2 NetBox VR Quatro:

1. Access Control

a.	Cardholders	20,000
b.	Access levels	512 per Network Node
c.	Time specs	512 per Network Node
d.	Simultaneous users	2
e.	Readers / Portals	8
f.	Inputs / Outputs	32
g.	Elevators	14 per Network Node
h.	Floors	52 per Network Node

2. Video Management

a.	Max IP Camera Streams	8
b.	IP Camera Resolution	IP camera dependent
c.	IP Camera Frame Rate	IP camera dependent
d.	Compression type	MJPEG, H.264

3. Platform

a.	Max Storage (internal)	4.0TB
b.	Storage Configuration	JBOD
c.	Processor	Intel Atom N2800

d.	Memory (RAM)	2GB DDR3
e.	OS	Linux Ubuntu 16.04 LTS
f.	OS/Application Storage	150GB SSD
g.	NIC (10/100/1000)	1
h.	Sustained Hard Drive Throughput	100Mbps
i.	Certifications / Compliances	UL, CE, FCC, RoHS
j.	Warranty	2 years hardware
k.	Dimensions (H, W, D)	13in x 13in x 8.5in (33.02cm x 33.02cm x 21.59xm)
l.	Weight	9.7lbs
m.	Operation Temperature	32° - 95°F (0° - 35°C)
n.	Storage Temperature	-4° - 158°F (-20° - 70°C)
o.	Operating Environment	Humidity 85%, non-condensing
p.	AC Input	100 - 240 VAC, 1.7A, 50/60 Hz
q.	MTBF	107,071 hours
r.	BTU/h	938

4. Minimum Client Requirements

a.	Operating System	Microsoft Windows 7 Microsoft Windows 10 Mac OS X Yosemite (10) Mac OS X El Capitan (11)
b.	Browser	Internet Explorer 11 Chrome 70 Firefox 63 Safari 8, 9
c.	Processor	Intel Core i3
d.	Memory (RAM)	4GB
e.	Hard Drive	100GB

I. S2 NetBox Virtual Machine is provided as a pre-configured virtual machine image that is ready to run on a VMware EXSi host.

1. The files that make up S2 NetBox Virtual Machine are stored in the Open Virtualization Format (OVF) packaging format. The OVF package is distributed as a single archive file called an OVA (Open Virtualization Application) file.

2. An S2 Network Node with M1-3200 blade, S2 MicroNode Plus, or S2 Network Node VR that is accessible to the Network Controller is required to run S2 NetBox Virtual Machine and will be used to license the system.

3. Portal licenses are expandable in 64-portal increments, up to 7,168 portals. When two specifications are given below, the first is for systems with a 16 to 64 portal capacity, and the second is for systems with a 128 to 7,168 portal capacity.

4. Access Control

Cardholders	40,000 / 150,000
Access levels	Unlimited
Card formats	64 per Network Node
Unique user roles	16
Simultaneous users	10 / 35
Time specifications	512

Portal capacity	64 / 7,168
Network Node capacity	64 / 512
Maximum inputs	2,000
Maximum outputs	2,000
Online transactions	40 million records / 400 million records
Elevators	14 per Network Node
Floors	52 per Network Node

5. Client Requirements

Operating system	Microsoft Windows 7 Microsoft Windows 10 Mac OS X Yosemite (10) Mac OS X El Capitan (11)
Browser	Internet Explorer 11 Chrome 70 Firefox 63 Safari 8, 9
Processor	Intel Core i3 or higher
Memory (RAM)	8GB minimum
Hard drive	100GB minimum

6. Minimum Provisioning Requirements

Storage capacity	128GB Pro Series SSD
Processor	Intel Xeon Quad Core
Memory (RAM)	8GB
Ethernet ports	1
Server host	VMware ESX 5.1 or later
S2 hardware	Minimum: 1 Network Node, MicroNode Plus, or Network Node VR
VMware hardware	Physical server running ESX v5.1 or later, vSphere Desktop Client, v5.1 or later
Warranty	1 year, software

7. Integrations

Video management	S2 NetVR series VMS and other major VMS manufacturers
S2 NetVR capacity	16 / 128
S2 NetVR camera capacity	1,024 / 4,096
Concurrent S2 client connections	10 / 35
Third-party VMS camera capacity	256 / 1,024
Supported Third-party access control and alarm hardware:	Allegion, ASSA ABLOY, DMP, BOSCH, Mercury

J. The S2 Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Controller and Application Blades connected to the system's inputs, outputs, and readers. The Network Node shall be supplied with 120V AC at a minimum of 2.3 amps. The Network Node can optionally be powered by 12V DC at a minimum of 7Ah. Internal SLA battery backup shall supply sufficient power to provide for an orderly shutdown of the system in case of loss of external power. External

battery backup shall be used to provide uninterrupted operation in the event of external power loss. Each Network Node shall support up to seven Application Blades. Communications between the Network Node and Network Controller shall be encrypted and authenticated using TLS digital certificates. Each Network Node shall have the following capabilities:

1.	Application Blades	7
2.	Readers	14
3.	Reader Groups	256
4.	Access Levels	512
5.	Portals	14
6.	Portal Groups	64
7.	Supervised Inputs	56
8.	Input Groups	64
9.	Relay Outputs	56
10.	Output Groups	64
11.	Temperature Inputs	56
12.	Time specifications	512
13.	Time spec groups	512
14.	Time specs per group	8
15.	Threat Levels	8
16.	Threat Level Groups	32
17.	Holidays	30
18.	Access levels	512
19.	Access levels per person	32
20.	Credentials per person	Unlimited
21.	Card formats	64
22.	Elevators	14
23.	Floors	52
24.	Floor Groups	128
25.	Time spec groups	512
26.	Credential Storage	Unlimited
27.	Activity Log Records	800,000
28.	OS	Linux
29.	Ethernet Ports	1
30.	Dimensions (H, W, D) Wall Mount:	17.0in x 15.0in x 6.75in (43.18cm x 38.1cm x 17.15cm)
31.	Dimensions (H, W, D) Rack Mount:	7.0inx19.0in x 15.0in (17.78cm x 48.26cm x 38.1cm)
32.	Weight	18 lbs (8.6 kg)
33.	Operation Temperature	32° to 95°F (0° to 35°C)
34.	Storage Temperature	-4° to 158°F (-20° to 70°C)
35.	Relative Humidity	5-90% non-condensing
36.	MTBF	297,000
37.	BTU/h	184

K. The S2 Network Node VR shall make and manage access control decisions with data provided by the Network Controller, provide recording, live streaming and playback of IP cameras connected to it. The S2 Network Node VR shall also manage the communication between the Network Controller and Application Blades connected to the system's inputs, outputs, and readers. The S2 Network Node VR shall be supplied with 120V AC at a minimum of 2.3 amps,

and it can optionally be powered by a 12V 7Ah SLA battery. Internal SLA battery backup shall supply sufficient power to provide for an orderly shutdown of the system in case of loss of external power. External battery backup shall be used to provide uninterrupted operation in the event of external power loss. Each S2 Network Node VR shall support up to four Application Blades. Communications between the S2 Network Node VR and Network Controller shall be encrypted and authenticated using TLS digital certificates. Each S2 Network Node VR shall contain a video management appliance that is designed to be integrated with an S2 NetBox or S2 Enterprise Security Management System (SMS). The integration provides a single user interface for the SMS access control and monitoring capabilities and the S2 NetVR video surveillance capabilities.

1. Video Management
   - a. Max IP Camera Streams: 8
   - b. IP Camera Resolution: IP camera dependent
   - c. IP Camera Frame Rate: IP camera dependent
   - d. Compression type: H.264

2. Platform
   - a. Max Storage (internal): 4.0TB
   - b. Storage Configuration: JBOD
   - c. Processor: Intel Atom N2800
   - d. Memory (RAM): 2GB
   - e. OS: Linux Ubuntu 16.04 LTS
   - f. OS/Application Storage: 150GB SSD
   - g. NIC (10/100/1000): 1
   - h. Sustained Hard Drive Throughput: 100Mbps
   - i. Certifications / Compliances: UL, CE, FCC, RoHS
   - j. Warranty: 2 years hardware
   - k. Chassis: 2U
   - l. Dimensions (H, W, D): 14in x 14in x 8.5in (35.56cm x 35.56cm x 21.59cm)
   - m. Weight: 10lbs (4.5Kg)
   - n. Operation Temperature: 32° - 95°F (0° - 35°C)
   - o. Storage Temperature: -4°- 158°F (-20° - 70°C)
   - p. Operating Environment: Humidity 85%, non-condensing
   - q. AC Input: 90 - 264 VAC, 47/63 Hz, 5A/3A
   - r. MTBF: 319,009 hours
   - s. BTU/h: 292

3. Minimum Client Requirements (video)
   - a. Operating System: Microsoft Windows 7
Microsoft Windows 10
Mac OS X Yosemite (10)
Mac OS X El Capitan (11)
   - Browser: Internet Explorer 11
Chrome 70
Firefox 63
Safari 8, 9
   - b. Processor: Intel Core i3
   - c. Memory (RAM): 4GB
   - d. Hard Drive: 100GB

L. The Application Blades shall interface with the Network Controller through the Network Node. The Application Blades shall be blade-style circuit cards. There shall be four types of Application Blades:

1. S2 Access Control Blade - The access control blade shall receive power via the ribbon cable bus directly from the Network Node blade. The access control blade shall supply up to 500 mA of power to one reader or 250 mA of power to each of two readers.

a.	Reader Connectors	2
b.	Max Reader Cable Length	500 feet (152m) (18 AWG twisted, shielded)
c.	Reader Power	500 mA
d.	Input Connectors	4
e.	Max Input Cable Length	2000 feet (610m) (22 AWG twisted, shielded)
f.	Output Connectors	4

2. S2 Input Blade - The input blade shall receive power via the ribbon cable bus directly from the Network Node blade. It shall support a wide variety of input supervision types including normally-open circuit and normally-closed circuits, and zero, one or two resistor configurations.

a.	Input Connectors	8
b.	Max Input Cable Length	2000 feet (610m) (22 AWG twisted, shielded)
c.	Supervision Types	4 (open, closed, normal, alarm)

3. S2 Output Blade - The output blade shall receive power via the ribbon cable bus directly from the Network Node blade. Both normally-open circuit and normally-closed circuit output devices shall be supported. The relay outputs shall support any output devices that operate on the following maximum electrical ratings: 30 Volts DC or AC, 2.5 Amps inductive or 5.0 Amps non-inductive.

a.	Output Connectors	8
b.	Contact Type	Form C
c.	Max Electrical Ratings	30 Volts DC, 2.5 Amps Inductive, 5.0 Amps non-inductive.

4. S2 Temperature blade - The temperature blade shall receive power via the ribbon cable bus directly from the Network Node blade.

a.	Temperature Inputs	8
b.	Max Temperature Cable Length	1000 feet (305m) (18 AWG twisted, shielded)
c.	Temperature Range	32° to 158° F (0° to 70° C)

M. Each S2 MicroNode Plus shall function as a node and as an access control blade. In addition, each S2 MicroNode Plus shall support one temperature input. The S2 MicroNode Plus may be supplied with 12VDC at 5 amps. With a 12VDC 5A power supply the total power available for all external output is 2000mA (24 watts). Alternatively, it shall also be possible to power the S2 MicroNode Plus from PoE switch that conforms to the IEEE 802.3af standard, or from PoE Plus switch which conforms to the IEEE 802.3at standard. With PoE (802.3af) as the power source the total power available for all external 12V output is 500mA (6 watts @12VDC). With PoE Plus (802.3at) as the power source the total power available for all external 12V output is 1000mA (12 watts @ 12VDC).

1.	Access Control Readers	2
2.	Access Levels	512
3.	Portals	2
4.	Portal Groups	64
5.	Reader Groups	256
6.	Supervised Inputs	4
7.	Input Groups	64
8.	Relay Outputs	4
9.	Output Groups	64
10.	Temperature Inputs	1
11.	Elevators	2
12.	Floors	4
13.	Floor Groups	128
14.	Time spec groups	64
15.	Credential storage	150,000
16.	Activity Log records	800,000
17.	Max Reader Cable Length	500 feet (152 m) (18 AWG twisted, shielded)
18.	Input Connectors	4
19.	Max Input Cable Length	2000 feet (610 m) (22 AWG twisted, shielded)
20.	Output Connectors	4; 2 wet / dry selectable
21.	Temperature Inputs	1
22.	Max Temperature Cable Length	1000 feet (305 m) (18 AWG twisted, shielded)
23.	OS	Linux
24.	Ethernet Ports	1
25.	MBTF	297,000
26.	Dimensions (H, W, D)	11.34in x 8.0in x 2.57in (28.77cm x 20.32cm x 6.53cm)
27.	Weight	3.2 lbs (1.45 kg)
28.	Operation Temperature	32° to 95° F (10° to 35° C)
29.	Storage Temperature	-40° to 158° F (-40° to 70° C)
30.	Relative Humidity	90% non-condensing
31.	MTBF	297,000
32.	Btu/h	204

N. All wall-mount enclosures shall have a lock requiring a key, and a cabinet door tamper switch.

2.4 SOFTWARE REQUIREMENTS

A. Operating System and Application Software:

1. The embedded operating system for the SMS is Linux Ubuntu 16.04 LTS (long term support) as the operating platform. The operating system kernel shall be open-source and no operating system training or certification shall be necessary.

2. The SMS application software shall be embedded in the system. The database shall be an embedded PostgreSQL relational database requiring a small footprint and provides high reliability. The web server shall be based on an embedded Apache™ web server enabling users to access and operate the system using a standard web browser.

3. The SMS shall support the following web browsers:

   a. Internet Explorer 11

   b. Chrome 70

   c. Firefox 63

   d. Safari 8, 9

B. S2 Software Licensing:

1. Software licensing shall be based upon the number of portals, cameras, and select features for one Network Controller. Software license upgrades shall be available if system portal and camera capacity must be increased. The S2 user license shall be valid in perpetuity and shall include one year of software updates from the date of shipment from the factory.

2. Licensing shall be controlled by a Product Key and an Activation Key. The Product Key contains the licensed system features and limits. To upgrade your system license to enable more cameras or more portals you will need a new Product Key. The Activation Key contains the software support expiration date. The keys are locked to the system license number. The system license number shall be viewable on-screen on the About page

C. Software upgrades shall be possible from a browser on any network-connected PC by uploading a software update to the Network Controller. The Network Controller shall automatically upgrade all connected Network Nodes. No client software installation shall be necessary.

D. Online Help and Documentation - The SMS shall be provided with complete embedded documentation. The online documentation shall include:

1. Context-sensitive online Help - (The Help displayed is specifically relevant to the current screen.) The online Help system shall provide explanations and procedures for all monitoring, administrative, and system configuration and maintenance functions. The Help system shall have linked table of contents, a linked index, and frequently asked questions pages. Each topic shall also have links to related topics. Each Help topic shall be printable.

2. Technical Support Notes - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

3. Installation Guides - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

4. Video Integration Guides - These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

5. End-User Task Guide - This document shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics

E. S2 Support Collaboration - It shall be possible, by the use of a network Support Collaboration Tool, for a technical support specialist to connect to the SMS and assist on-site technicians from

remote network-connected locations. It shall only be possible for an on-site system administrator or technician to initiate this connection. There shall be no way to initiate this connection from outside of the secure network.

F. Language Support - The SMS shall be provided with multiple language support. The ability to switch from one language to another shall be accomplished through the user interface. Translation of the user interface, online help and documentation into other languages shall be available. The languages supported shall include:

1. English
2. Spanish
3. Portuguese
4. French
5. Italian
6. Thai
7. Chinese Traditional
8. Chinese Simplified
9. Japanese

G. Date Formats - The SMS shall support global date formats as follows:

1. mm/dd/yyyy
2. dd/mm/yyyy
3. yyyy/mm/dd

H. Floorplans - The SMS shall provide graphic floorplan capability including graphic display of links to other floorplans, alarms and system resources such as portals, IP video cameras, inputs, outputs, and temperature monitoring points.

1. The Network Administrator holding at least a Setup user role shall be able to graphically configure device icons onto the floorplan images, and to upload additional floorplan images. JPEG images shall be supported, and the maximum size for a floorplan image shall be 256K.

2. It shall be possible to create floorplan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as custom user roles. If a floorplan group is assigned to a particular system user then the floorplans in that group shall be viewable by that system user.

I. Personnel Data - The SMS shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.

1. All person data in the system shall be integrated onto one tabbed page for viewing, editing, and deletion by system users.

2. A system user holding at least an Administrator user role shall be able to create, delete, and modify person records, including access levels and access level groups.

3. A system user holding at least a Setup user role shall be able to configure the display of person records. For example, the user shall be able to hide various tabs, and configure the User-defined tab by changing the tab label and customizing any of the 20 data fields that appear on the tab. The user shall be able to enter text, numbers, Boolean expressions, or user-defined list information into these data fields. The user shall also be able to define UDF value lists, which can be displayed as pre-entered drop-down lists for user-defined data fields.

4. The Person page shall contain a Journal tab, allowing the operator to enter and save a journal entry associated with the person.

J. Browser Based Data Import and Export - A Data Operations Tool shall be provided that supports, via an API, the import and export of personnel data. This tool shall make possible the pre-populating and ongoing populating, of cardholders into the SMS database. Data that shall be importable and exportable shall include:

1. Controller

2. Partition

3. FirstName

4. LastName

5. MiddleName

6. Deleted

7. Credentials [list]

    a. HotStampNum

    b. EncodedNum

    c. CardFormat

    d. Status

    e. ExpirationDate

    f. RemoteLockUserType

    g. Profile

8. AccessLevels [list]

    a. AccessLevelName

    b. ActivationDate

    c. ExpirationDate

   d. AutoRemove
9. PersonID
10. PIN
11. ExemptFromPin
12. UDF1-20
13. Notes
14. ActivationDate
15. ExpirationDate
16. BadgeLayout
17. PictureFile
18. Phone
19. Email
20. Email2
21. Location
22. OtherContactName
23. OtherContactPhone1
24. OtherContactPhone2
25. Vehicles [list]
   a. Color
   b. Make
   c. Model
   d. State
   e. Licnum
   f. Tagnum
26. AntiPassBackPriv
27. ExemptFromNonUse
28. TracePerson

29. UseExtendedUnlock

30. LoginUserName

31. LoginUserPassword

32. LoginUserRole

33. LastModDateTime

34. LastModUser

K. Data Security:

1. Administrative access to the security management application and the personnel data shall be password protected and controlled by roles-based authorizations.

2. In addition, it shall be possible to enable secure communications between the Network Controller and web browsers, and between the Network Controller and Network Nodes.

3. Communication between the Network Controller and browsers shall be secured using TLS digital certificates. The available options are:

   a. Generate a self-signed certificate that is signed with your web server's own private key. This certificate shall provide encryption but not authentication.

   b. Upload a certificate that is signed by a certificate authority (CA) to the Network Controller. This certificate shall provide both encryption and authentication.

   c. Upload your organization's own certificate and matching key to the Network Controller.

4. Communication between the Network Controller and the S2 M1-3200 Network Nodes shall be encrypted and authentication/tamper detection shall be done using TLS digital certificates. Authentication will occur when the Network Node connects to the Network Controller. The available options are:

   a. Use a default self-signed certificate. The default built-in certificate for Network Node communication shall use 2048-bit RSA key with SHA1 signature. The cipher mode to encrypt the data shall be AES256-GCM with SHA384 hash function.

   b. Generate your own self-signed certificate, which is signed by your web server's own private key. This certificate shall provide encryption but not authentication.

   c. Upload a certificate that is signed by a certificate authority (CA) to the Network Controller. This certificate shall provide both encryption and authentication.

   d. Upload your organization's own SSL certificate and matching key to the Network Controller.

5. Communication between the Network Controller and other systems (when using the API) shall be secured using SSL and authentication/tamper detection shall be done using the SHA-1 algorithm.

L. Data Backups - It shall be possible to configure regular automatic database backups.

1. It shall be possible to back up a solid-state S2 NetBox Network Controller or S2 NetBox Extreme Network Controller to a built-in solid state hard drive.

2. It shall be possible to back up an S2 Enterprise 50 or S2 Enterprise 100 Network Controller to a built-in solid state hard drive.

3. It shall be possible to save backups from any Network Controller to separate network attached storage (NAS) and file transfer protocol (FTP or SFTP) servers.

4. It shall also be possible to setup regular automatic creation of database archive files.

M. On-board Data Management - Each night the SMS shall truncate a sufficient number of the oldest records held on-board to reduce the database to its set limit, if required. This shall create the needed storage space for additional system activity records. Truncation will be performed on a First-in, First-out (FIFO) basis.

N. Partitions - It shall be possible to create multiple partitions for the management of multiple security systems or multiple populations.

1. It shall be possible to limit access to the data and resources of one partition to those with permissions for that partition.

2. It shall be possible for each partition to have its own population, resources, rules, events, video management, log data, reports and network resources.

3. It shall be possible to grant Monitor, Administrator and Setup privileges for multiple partitions to the same user. It shall also be possible to create custom user roles for each partition.

4. A Network Node can reside in only one partition. It shall be possible to create partitions without Network Nodes.

O. User Roles and Permissions - There shall be four pre-programmed levels of user roles, and custom user roles can be configured in the system with different permissions for each user:

1. Master Partition Monitor - These users may use the functions in the Monitor menu only within the Master (default) partition. Monitor functions shall include viewing the Activity Log, cameras, and floorplans.

2. Master Partition Administrator - These users may use the functions of both the Administration and Monitor menus only within the Master (default) partition. Administrative functions shall include adding and editing person information in the enrollment database, issuing and revoking cards, generating reports, and performing database backups.

3. Master Partition Setup - These users may use the functions of the Setup, Administration, and Monitor menus only within the Master (default) partition. Setup functions shall include defining access control, alarm event behavior, camera settings, floorplan images and configurations, holiday and time specifications. Setup functions shall also include: designation of network resources such as time and DNS servers, email and network storage settings; performance of system maintenance such as database backup and restore, software updates and file cleanups; designation of time zone, daily backup schedule and enrollment readers.

4. Full System Setup - These users may use the functions of all menus in all partitions.

5. Custom User Roles - In addition to the roles above the system shall also support the creation of detailed user permissions regarding which data operations, cameras, floorplans, elevators, events, access levels, access level groups, portals, reports, and personal data fields the system user may see, edit, delete, or control.

P. Alarm Panels - The SMS shall interface with alarm panels via wiring to an input point and an output point on each panel. This provides the ability to arm and disarm the panels, and to trigger events based upon alarm panel status.

Q. Intrusion Panels – The SMS shall integrate with the following intrusion panels:

a. BOSCH B and G Series control panels running with firmware version 3.03.014 or later.

b. Digital Monitoring Products (DMP) XR150, XR500 and XR550 Command Processor Panels.

2. Security administrators can use events on an intrusion panel, such as a zone going into an alarm state, to trigger events in the SMS. They can also use events in the SMS to control operations on an intrusion panel, such as the arming or disarming of an area.

3. Monitors can use the Intrusion Panel widget to view configuration and status information for an intrusion panel. They can also arm and disarm areas, bypass and reset zones, and activate and deactivate outputs associated with the panel.

4. The intrusion panels shall communicate their status to the system using port 6000-6063 (DMP), or port 7700 (BOSCH).

5. Intrusion panel system messages shall identify the panel that generated the message.

6. The system shall support at least 200 DMP panels and at least 255 BOSCH panels.

7. For DMP panels only: The system shall assign precedence to arm/disarm commands sent from the UI to the DMP panels.

8. Communication errors between DMP panels and the SMS shall be retried after one minute. Communication errors between BOSCH panels and the SMS shall be retried after two minutes, but this default retry time is configurable.

R. Alarm Events - The SMS shall manage alarm events.

1. It shall be possible to delay an input’s change to the Alarm state by a specified number of seconds. The range of delay options shall be 0.5 seconds or from 1 to 120 seconds.

2. It shall be possible to associate specific actions with each alarm event. These actions may include, but are not limited to:

a. Lock and Unlock portals.

b. Activate and Deactivate relay outputs.

c. Arm and Disarm input groups.

d. Pulse outputs or output groups.

e. Arm and Disarm alarm panels.

f. Send emails and SMS messages.

g. Move cameras to preset positions.

h. Switch to a video monitor.

i. Record video.

j. Momentarily unlock portals.

k. Change the threat level for a location, and (optionally) for its sub-locations.

l. Make entries in the Activity Log.

m. Play a digital sound file; it shall be possible to specify that it play in a loop until cleared or acknowledged.

n. Display alarms in different colors.

o. Set a priority for an alarm (one of 20 levels, with 1 being the highest).

p. Require a duty log entry.

q. Clear an alarm automatically or require an acknowledgement.

r. Push a Magic View to an S2 Magic Monitor.

s. Push a Magic View to a group of S2 Magic Monitors.

t. Push an S2 NetVR camera stream to an S2 Magic Monitor.

u. Push an S2 NetVR camera stream to a group of S2 Magic Monitors.

3. A system user holding at least a Setup user role shall be able to create, delete, and modify alarm system inputs, input groups, outputs, output groups, alarm panels, and events.

4. It shall be possible to trigger events based on system activity such as:

a. Failed login attempts.

b. Video motion detection.

c. Camera failure and camera restore events.

d. Valid or Invalid card reads.

e. Portals held or forced open.

f. Valid card reads with a specified access level.

g. Inputs entering an alarm state.

h. High and low temperature events.

i. Low batter voltage and low battery capacity events.

j. Alarm panel arming failures.

k. Alarm panel zone faults.

l. Tailgating and passback violations.

m. Occupancy limit exceeded

n. Region empty violations.

o. Network Node power failure, communication failure, timeout, and tamper events.

5. It shall be possible to clone an event which creates an event with all attributes of the original, needing to change only the event's name and any attributes it will not have in common.

S. Activity Monitoring:

1. The SMS shall support a Monitoring Desktop that integrates video, system Activity Logs, floorplans, threat level control, ID photos, and alarm notifications.

2. Activity Log viewing includes one-click navigation to person records.

3. The system shall support a Widget Desktop that allows the creation of custom monitoring layouts. Within a custom layout, widgets display live video, system Activity Logs, alarm notifications, ID photos, floorplans, duty log entries, portal status displays, and intrusion panels.

4. The system shall support specific alarm events in the Events and Alarm Workflow widgets in one of the following three modes:

a. *Activations do not display alarms* – No alarm events shall be displayed in either widget when such events are configured in this mode. All settings shall be disabled in the Acknowledgements section of the page.

b. *Multiple activations display a single alarm* – Alarm events shall appear in both widgets each time the alarm input is triggered. Each subsequent trigger of the same input shall display a new alarm event which shall replace the previous one.

c. *Multiple activations display multiple alarms* – Alarm events shall appear in the Events widget as described in item b above. The Alarm Workflow widget shall simultaneously display a separate alarm event for each alarm trigger.

5. Many widgets support multiple partition viewing and filtering. For example, the Activity Log widget can display data from multiple partitions and data filtered by event type or reader group, and/or based on the text content of the event. Additionally, the system shall support the use of category filters, including Access Control, Alarms and Events, Threat Levels, System Admin, Devices, Network Nodes, Access Granted, and Access Denied.

6. It shall also be possible to view cameras, Activity Logs, and floorplans on separate monitoring pages within the application.

7. The system shall support tracing a person's activity in the current partition if the "Trace this person" check box is selected in the person record.

    a. The traced activity is displayed in bold in the color selected for "Trace person log color" on the Network Controller page.

    b. In addition, if an event is selected for "Trace person event" on the Network Controller page, the event is triggered each time a traced person makes an access attempt. These event activations can be reported using a Trace people filter in a custom history report.

    c. When a user opens a person record in which "Trace this person" is enabled, a dialog box shall indicate that the person's activity is being traced.

8. The Activity Log shall be capable of displaying additional cardholder information, including "Hot Stamp", "Encoded Number", and "Company ID".

9. The system shall include a Photo Display Widget, which allows operators to display a current ID photo based on the most recent access request.

10. It shall be possible for a system user to place restrictions on the retention and tracking of access activity by setting options on the Network Controller page.

    a. The user can set an option to show Access Granted events in the Activity Log only when both a credential and PIN are used for access.

    b. The user can set an option to have the system retain Access Granted and Access Denied events only for a specific number of days. Once an Access activity record has been stored for the specified number of days, it shall be purged from the database. Access activity records shall not be included in archives.

T. Network-based Cameras and Video Surveillance - The system shall provide live IP video surveillance capability. The number of supported cameras shall be limited only by license. The system's video capabilities shall include video monitor switching based on access activity. The system shall provide monitoring, configuration, and administration of IP video. Cameras can be separately monitored or monitored in groups.

1. Presets - The system shall support the creation, deletion, and editing of camera preset positions in the system. It shall also be possible to save changes in preset positions directly to a camera.

2. Views - The system shall support the creation, deletion, and editing of multiple camera views, specifically Quad views (four cameras), S2 NetVR 2x2 view and S2 NetVR 1+7 views. The application shall provide a drop-down pick list for selecting current views or naming of new views.

U. Access Control:

1. The SMS shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a log file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.

2. Time Specifications: Each time specification must be assigned a unique alphanumeric name of up to 64 characters. The definition of a time specification shall require the assignment of both a start time and an end time.

    a. Each day of the week shall be individually assignable for inclusion in time specifications.

    b. Up to eight holiday groups per partition shall be assignable for inclusion in time specifications. If no holidays are assigned to a time specification then no holiday access shall be allowed. It shall be possible for users to change the default holiday group names (hol1 through hol8) to more meaningful names.

    c. Time specifications shall be assignable to access levels, output groups, portal groups, input groups, and alarm events.

    d. Time specifications shall function appropriately per Network Node for the time zone specified for that Network Node.

3. Card Formats - The system shall support the use of readers that use the Wiegand Reader Interface. The system shall support but not require the use of the card facility code. The system shall also support the use of the Magnetic Stripe ABA track 2 card data formats.

    a. It shall be possible to create new card formats, designate start bits and bit lengths for facility codes and card ID numbers, and designate parity bits. The system shall support up to 64 different card formats, and 32 formats can be enabled at a time. With compatible Mercury boards the system shall allow for up to 16 card formats to be designated as Mercury-supported. These Mercury-supported formats will be enabled on Mercury panels.

    b. It shall be possible to reverse the read order of the bits in the facility code and/or card ID portions of a card format.

    c. It shall be possible to view and change the default parity bit definitions for a card format.

    d. A card formats shall be disabled by default. Once enabled, the format appears in the card format dropdown within the credential section of a person record.

    e. The system shall support the use of a concatenated version of the FIPS 201 format (Federal Information Processing Standard Publication 201)

    f. FIPS 201 128-bit format. This system-owned credential format is based on Federal Information Processing Standard (FIPS) 201. It can be enabled and disabled, but it cannot be modified. The credential number is a Federal Agency Smart Credential-Number (FASC-N) containing 32 characters, encoded as binary-coded decimal (BCD) digits. When issuing a credential using this format, a user can either enroll the credential via an enrollment reader or use a dialog box to enter a value for each of the fields that make up the 32 BCD string

    g. Administrators shall be able to specify a specific number of days of non-use that will be allowed before unused cards will be disabled. Administrators shall be able to exempt individual users from this non-use rule.

    h. The system shall support the Southwest Texas Regional Advisory Council (STRAC) UUID format of 128 bits displayed as 32 hexadecimal characters.

4. Access Levels - The system shall be capable of storing unlimited access levels in each partition.

    a. Each access level must be assigned a unique alphanumeric name of up to 64 characters.

    b. The definition of an access level shall require the assignment of a reader or reader group, and a time specification.

    c. It shall be possible to also assign an elevator floor group to an access level.

    d. It shall be possible to create a temporary access level by assigning an activation date and/or expiration date for any of a person's assigned access levels. It shall also be possible to have the system automatically remove a temporary access level once it has expired.

5. Access Level Groups – The system shall support the creation of access level groups, which will allow users to assign multiple access levels at once. Users with at least a Setup user role can create single-partition access level groups that can be viewed and assigned within the partition in which they were created. Users with the Full System Setup role can also create multi-partition access level groups, which can be viewed and assigned across partitions, and can contain access levels from multiple partitions, depending on the user's permissions.

6. First-in Unlock Rule: The system shall support the use of a First-in unlock rule. It shall be possible to use this rule to control the unlock behavior of portal groups with assigned unlock time specs.

    a. The First-in unlock rule shall require a card read of a specified access level. The portals in the group shall unlock only when the rule is satisfied and the unlock time spec is valid.

    b. There can be up to 64 First-in unlock rules in the system at a time.

7. Double Card Presentation - The system shall support the use of a Double Card Presentation mode. This mode shall allow the presentation of a card twice in quick succession at a designated reader. Such a "double read" shall change the locked portal to an unlocked state until a subsequent relock event or user-designated timeout occurs. The double card presentation mode shall be enabled on an individual portal basis and shall also require a designation on the access level assigned to the cardholder. The mode shall adhere to time spec and threat level restrictions.

8. Keypad timed unlock - It shall be possible to enable a timed unlock feature for a portal that has a combination reader/keypad device. Once this feature is enabled, any cardholder with valid access to the portal shall be able to specify how long the portal will remain unlocked.

    a. A cardholder presents his or her card and then enters the associated PIN, followed by the number sign (#) and the number of minutes (1-99) the portal should remain unlocked.

    b. The portal will remain unlocked for the specified number of minutes; unless it is closed before the timer expires. If the portal remains open after the timer has expired, a [Door Held Open] alarm will be activated.

c. If reader/keypad devices are located on both sides of the portal, cardholders will be able to use either device to initiate a timed unlock.

9. Keypad Commands - For Network Node connected access control keypads and combination card reader/keypads, users having the authorized access levels shall be capable of executing keypad initiated commands based on pre-defined two-digit number codes.

   a. Keypad commands shall be defined by mapping one or more two-digit codes to events defined in the system using the “Setup: Alarms: Keypad Commands” page.

   b. Keypad commands shall be assigned to specific keypads using the “Setup: Access Control: Readers/Keypads” page.

   c. Keypad commands shall be assigned to specific access levels using the “Setup: Access Control: Access Levels” page.

10. Holidays - The system shall support up to 30 holidays Network Node. Each holiday must be assigned a unique alphanumeric name of up to 64 characters. The definition of a holiday shall require a start date and an end date. Holidays shall have the ability to span several days using only one holiday slot. Holiday definitions shall support the designation of a start time and an end time. If no start time is designated then the system shall default to 00:00 (start-of-day). If no end time is designated then the system shall default to 24:00 (end-of-day). Holidays shall require the use of 24-hour time format, e.g. 17:00 is 5:00PM.

11. Portals - A portal is a configurable object which can contain a reader or two readers, with or without keypads; a door status monitor (DSM); a request to exit (REX) device; and a lock. A system user with at least the Setup role shall be able to view current portal definitions, change portal definitions, delete portals, and create new portals. Creating a portal defines the access and alarm behavior of the access point. This can include:

   a. Card readers and keypads.

   b. Output for locking.

   c. Input for monitoring the door switch.

   d. Input for a Request-to-Exit function.

   e. Local alarm outputs and system alarm events.

12. Portal Groups - It shall be possible to create groups of portals and to assign an unlock time specification to the entire group. All the portals in the group shall remain unlocked during the time specified.

   a. It shall be possible to use portal groups for assigning or withholding assignment of these groups to system user permissions known as custom user roles. If a portal group is assigned to a system user then the portals in that group shall be viewable and unlockable by that system user.

13. Portal Alarm Conditions – Depending on the device type, system-wide events can be configured for up to seven portal alarm conditions. The seven alarm conditions are as follows:

a. Forced: When a portal is opened and there has been no card read, nor request to exit.

b. Held: When a portal is held open past the expiration of the shunt timer.

c. Invalid: When the portal reader reads a card for which there is no entry in the database.

d. Valid: When the portal reader reads a card for which there is a valid entry in the database.

e. Duress: A card has been presented to the reader, followed by an entry of the cardholder's duress PIN into the keypad.

f. Double Card Presentation: For a portal with Double Card Presentation enabled, a qualified user has performed a double read to unlock the portal.

g. Unlock: The state of the portal's RU (Remote Undog) exit device has changed from DNE (Dog On Next Exit) to Dogged (unsecured).

14. Two-man entry restriction: It shall be possible to require two valid card reads by different cardholders within a specified number of seconds for entry to a specific portal.

15. Escort Rule - The system shall support escorted access control rules by assigning one of the following two escort types to each cardholder:

a. Escort - Cardholders with this access level shall enable access for persons requiring escorted access by presenting their credential at a card reader within 15 seconds after those requiring escorted access.

b. Requires Escort - Cardholders with this access level shall be unable to access the portal unless a valid "Escort" cardholder presents their credential at the card reader within fifteen seconds after the "Requires Escort" credential has been presented. Otherwise, access will be denied and the Activity Log shall display a message with the reason code {NO ESCORT}.

16. With compatible Mercury boards, the system shall support Facility Code Mode for reader/keypads, with the following available options.

a. None (the default): The facility code is treated as part of the overall encoded credential number. A card matching only the facility code will not be granted access.

b. Configuration: Facility-code only checking is turned on only while the complete set of credentials is being downloaded to the Mercury panel. Once the credential download is complete, the behavior is the same as for the "None" setting.

c. Offline: Facility-code only checking is turned on only when the SIO is disconnected from its Mercury panel (via the RS-485 link). When the SIO is connected to the panel, the behavior is the same as for the "None" setting.

d. Configuration and Offline: Facility-code only checking is turned on both during the credential download and when the SIO is disconnected from its Mercury panel. At all other times, the behavior is the same as for the "None" setting.

e. Permanent: Facility-code only checking is always turned on.

17. Anti-passback - The system shall support both regional and timed anti-passback access control. For anti-passback functions, it shall be possible to configure regions, assign readers to those regions, and specify events for response to tailgate, passback, and occupancy limit violations. It shall also be possible to designate parent regions for hierarchical anti-passback.

    a. Grace: It shall be possible for a system Monitor or Administrator to Grace Card holders from passback and tailgate violations.

    b. It shall also be possible to set a specific time for all cardholders to be graced daily.

    c. The system shall be able to automatically place the cardholder in a predefined region upon the selection of the grace option.

18. Mustering - To aid in evacuation management it shall be possible to designate a region or regions for mustering. It shall be possible to quickly get an occupancy count and occupant list for any region.

19. Scheduled Actions - It shall be possible to specify system actions to occur at scheduled times. When scheduling an action, it shall be possible to specify whether the time specifications for the scheduled action will be based on the time zone set for the local Network Node or the time zone set for the Network Controller. Scheduled actions can include:

    a. Arming and disarming inputs and input groups.

    b. Activating and deactivating outputs and output groups.

    c. Locking and unlocking portals and portal groups.

    d. Locking and unlocking elevator floors and floor groups.

20. Floor plans - The system shall support displaying of active graphic floorplans and configuring each floorplan with icons representing system resources: cameras, portals, temperature points, and alarms. A network administrator holding at least a Setup user role shall be able to upload floorplan images and graphically configure device icons onto the floorplan images. Viewing floorplans will require the Adobe Flash Player plug-in for the browser.

    a. It shall be possible to create floorplan groups for assigning or withholding assignment of these groups to system user permissions known as custom user roles. If a floorplan group is assigned to a system user then the floorplans in that group shall be viewable by that system user.

21. Elevator Control - The system shall be capable of controlling elevator access to floors. The system shall control up to 52 floor buttons per Network Node, or up to 28 floors with floor selection tracking. With compatible Mercury boards, the system shall control up to 128 floor buttons per elevator cab, with or without floor selection tracking.

    a. It shall be possible to create, change, or delete floor groups, and to assign a free access time specification to a floor group. The floors in this group will be freely accessible during the times defined by the chosen time specification.

    b. It shall be possible to create elevator groups for assigning or withholding assignment of these groups to system user permissions known as custom user roles. If an

elevator group is assigned to a system user then the elevators in that group shall be viewable by that system user.

c. Users assigned to custom user roles for one or more elevator groups may be given Free Access privileges to manage access to the elevators in those groups by using the Scheduled Actions page or an Elevator Status widget to:

1) Momentarily enable free access for an elevator floor button. This will allow persons to temporarily access one or more floors without the need for an access control transaction such as a card read.
2) Schedule an extended period of free access to one or more floors. This will allow persons to access the floors without constraints for the duration of the free access schedule.

d. Floor Tracking - Users may configure optional inputs on the SMS that shall change state when a corresponding floor selection button on an elevator is pushed, enabling the system to monitor the status of each floor selection button in relation to specific access credential transactions.

e. The system shall support Elevator Floor Tracking

1) The system shall support optional inputs that change state when the corresponding floor-select buttons are pushed, allowing the system to detect each button's status.
2) The system shall support an optional input that will change state and trigger an event, when the elevator's duress/emergency button is pushed.

f. Users may configure an optional input for each elevator and corresponding event on the SMS when the elevator's duress/emergency button is pressed.

V. Threat Levels:

1. It shall be possible to configure up to eight threat levels per partition. It shall be possible to alter security system behavior using threat levels. Groups of threat levels may be created and assigned to portal groups, access levels, input groups, output groups, floor groups, and event actions. The behavior of groups, access levels, and event actions with assigned threat level groups shall change based upon the current system threat level.

2. The SMS shall support 32 threat level groups.

3. It shall also be possible to change the system threat level in response to an alarm event.

4. The current system threat level shall display in the title bar of the security application interface and on floorplans.

W. Location-based threat levels - The system administrator shall have the ability to define locations. This allows for threat levels to be assigned to individual locations.

1. Within each parent location, sub-locations can be created, and additional sub-locations can be created within each of these, and so on. This creates a location hierarchy.

2. Locations shall contain portals.

3. Threat levels can be applied to any location within the hierarchy.

X. Appropriate Use banner - The system administrator shall have the ability to enter text (such as an appropriate use statement) to be displayed on the login page.

Y. Reports:

1. The SMS shall support a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.

2. It shall also be possible to produce reports directly from the Network Controller based on data in archive files on FTP or SFTP servers, network attached storage, or the built-in hard drive.

3. The SMS shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.

4. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.

5. The system shall be capable of sorting users by various criteria, including email address, and allow for email groups to be selected for auto-distribution.

6. Report generation shall not affect the real-time operation of the system.

7. The specific reports provided shall include the following:

a. Configuration Reports

1) As Built - A graphical report that displays an image of each Application Blade in a Network Node and the specific resources (inputs, outputs, readers, etc.) configured for that blade. The network settings for the Network Node shall also be included. This report shall display an image of each Mercury panel being used and specific resources configured on those panels.
2) Cameras - Displays all camera configuration information including control address, IP port, and camera type.
3) Camera Presets - Displays configured presets for each camera in the system.
4) Elevators - Displays elevator configuration information including Network Node, reader, floor to output mappings, floor select, and duress/emergency inputs.
5) Floor Groups - Displays all configured floor groups for use in elevator control.
6) Holidays -Displays holiday specification information.
7) Portals - Displays portal definition information including reader, DSM input, REX input, alarm outputs, and events.
8) Portal Groups - Displays a list of all defined portal groups.
9) Reader Groups - Displays defined groups of readers.
10) Remote Locksets - Available if the Remote Locksets feature is licensed for the system. Displays the following information for each remote lockset: name, IP address, synchronization status, serial number, last completed update time, firmware version, battery voltage, assigned remote lockset profile, and number of stored cardholders. The report can be sorted by any of the columns.
11) Resources - Displays all configured system resources including readers, inputs, outputs, elevators, and temperature points.

12) Threat Level Groups - Displays all configured threat level groups and the threat levels assigned to them.
13) Threat Levels - Displays all configured threat levels including the description and color assignment.
14) Time Specs - Displays all configured time specs currently in the system. Time specs, which define allowed access times, are used as part of access level definitions.

b. History Reports

1) Access History - Displays access history based on an entered query. The system user can specify the query using either the keyboard or point-and-click selection. Access history reports shall include the ability to include elevator access requests.
2) Alarm Resolution – Provides a report that tracks alarm duration. This is the period between the activation of an alarm and its resolution. Alarms are individual activations of events defined in the system. For an alarm to be resolved, it must be acknowledged (if acknowledgement is required according to the associated event definition) and its underlying cause must be cleared.
3) Custom Report - Provides the capability to create custom reports of historical data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Custom report output shall be user selectable for HTML, PDF or CSV format. Custom report configuration shall include page size, orientation, and column width and shall automatically notify the user if the selected configuration exceeds the selected page size.
4) General Event History - Displays time, type of activity, and activity details for a variety of event types. The system user can select the specific event types for the report.
5) Portal Access Count - Display how many times users have used a portal.
6) Audit Trail - Displays an audit trail of system changes and the name of the system user that made the changes. It shall be possible to specify the dates and times covered in the report.
7) Duty Log - Displays duty log comments residing in the current security database, including archives. For each duty log comment, the report shows the date and time the comment was entered, the person who entered the comment, the date and time of the logged event associated with the comment, and the Activity Log message followed by the specific comment text.

c. People Reports

1) Access Levels - Displays all access levels entered into the system including time specification, reader/reader group, and floor group.
2) Credential Audit - Lists existing credentials by their status settings (such as Active, Damaged, Lost, or Not Used). Before running the report, users can filter the data to see only credentials with a status setting, or only credentials that were not used with a specific number of days from the date they were issued.
3) Current Users - Displays a list of all security system users currently logged in to the security system website.
4) Custom Report - This provides the capability to create custom reports of personnel data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Custom report output shall be user selectable for HTML, PDF or CSV format. Custom report

configuration shall include page size, orientation, column width, and shall automatically notify the user if the selected configuration exceeds the selected page size.

5) Occupancy - Displays a list of defined regions with the number of people currently occupying each region and the maximum number of occupants allowed, if a maximum has been specified.
6) Photo ID Gallery - Displays all the photo ID pictures in the system and the person's name.
7) Photo ID Requests -Displays all outstanding badge print requests and lists ID, name, badge layout, activation date, request date.
8) Portal Access - Lists people with access for a selected portal.
9) Roll Call - Allows you to select a defined Region from the drop-down and see a list of people currently in that region.
10) Roster - Displays every person entered into the system and it lists name, ID photo, expiration date, username, and access level.

Z. Administration - The SMS shall provide for the performance of system administration tasks from any network-connected computer with a browser. Most of the administrative, maintenance, and configuration utilities and functions shall require a SMS user with at least a Setup user role. Information from the network administrator shall, in many cases, also be required. These administrative tasks shall include but not be limited to:

1. Generating reports:

a. The system shall support a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.

b. Alternatively, the system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a pdf file or put into a spreadsheet.

c. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.

d. A system user holding All Administration permissions, or permissions to view and edit specific types of reports, shall be able to view and create reports.

2. Database backups:

a. The system shall create database, or full system data backups, each night at 00:15 hours. These backups shall be stored in ROM and written to the drive on the disk-based controller.

b. It shall also be possible for system users to create such database backups at any time. Any database backups onboard the Network Controller may also be downloaded to off controller storage by the system user at any time.

c. Backups shall also be written to network attached storage (NAS), or to an FTP or SFTP server if such storage has been configured in the system.

d. A user with at least a Setup user role shall have the ability to schedule a time for the daily transfer of backups to NAS. The user can specify that the transfer will occur after the daily backup or at a specific time of day.

3. System restore:

a. The system shall be able to restore its database, or the full system data, from a backup. Restoration of the system shall only be possible from a backup copy onboard the Network Controller. It shall, therefore, be possible to upload a copy of a database backup from any network attached storage.

b. It shall be possible to review backups by date and description and select the desired backup for upload to the Network Controller or restoration as the current system database.

4. Software updates:

a. Software updates, upgrades and patches shall be provided from time to time. The system shall be able to update its software from these .upg files. Update of the application software shall only be possible from an update file onboard the Network Controller. It shall, therefore, be possible to upload a copy of the software update from any network attached storage or from any PC drive or desktop.

b. Software updates may involve the Network Controller only or may include updates for the Network Node(s) also. The monitoring of the security system may be unavailable for several minutes during this process.

5. File upload - The system shall support uploads of files for use in and with the system. Supported files include:

a. Floorplans in .jpg format

b. Badge layouts

c. ID photos in .jpg format

d. Database backups

e. Software license files

f. Software updates

g. Threat level icons in .jpg format

h. Sound files (.wav) for use in event alerts

6. Setting system time, time zones, and time servers:

a. The SMS shall support the setting of time zones by selection of a drop-down pick list. Time zones shall be separately settable for the Network Controller and for each S2 M1-3200 Network Node, S2 MicroNode Plus, or Mercury panel in the system. An extensive list of world-wide time zones shall be provided. Adjustments for daylight saving time (summer time) shall be automatic.

b. The SMS shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the Network Controller and its Network Nodes are regularly synchronized with the exact time used by all other network resources.

c. It shall also be possible to manually set the system date and time.

7. Changing passwords:

a. Person data maintained in the system may also contain a user name and password for logging on to the security application website as a system user. The system shall support the changing of administrator passwords. It shall be required to enter the password twice for verification purposes.

b. Administrators shall be able to specify a minimum number of characters that users must include in their login passwords.

c. Administrators shall be able to specify that users' login passwords must contain a combination of letters, numbers, and special characters.

d. Administrators shall be able to set a password expiration period in months (from 1 month to 12 months) for all passwords in the current partition. Whenever a user changes his or her password, it will remain in effect for the selected number of months.

e. It shall also be possible to integrate an LDAP or SLDAP server for single-user logon authentication. This will reference the LDAP-stored password for use by the system.

8. Issuing and revoking cards (credentials):

a. Access cards shall be assignable by the system user either by entering card data directly into the person record or by use of an enrollment reader. Access levels shall be assignable through the user interface by selection from the list.

b. Access cards shall be revocable at any time. A system user holding at least an Administrator user role may perform this action. Revoked cards shall stop functioning immediately.

c. A system user holding at least the Administrator role may also disable an access card by changing its Active status to Clear, Damaged, Disabled, Expired, Forgotten, Lost, Missing Active, Missing Disabled, Not Returned, Not Used Not Validated, Returned, Stolen, Suspended or Temporary Expired. The card will not function with any of these status settings (unless the setting has been customized, as described below). Running a Credential Audit report shall allow existing cards to be viewed by their status settings.

d. A system user holding at least the Administrator role may customize any of the following access card status settings: Clear, Damaged, Forgotten, Lost, Not Returned, Not Validated, Returned, Stolen or Suspended. The user can change the name and/or description of the status setting, and can specify that a card to which the setting is applied will continue to function.

e. A maximum number of active cards per person can be enabled for the system. Once a person has reached the system limit, a new card can be added for that person only if one of his or her active cards is revoked or disabled.

f. When “Enable credential profiles” is selected on the Network Controller page, it shall be possible to assign credential profiles to individual credentials to determine the number of days of non-use before they expire.

g. It shall be possible to set expiration dates for individual credentials in a person record. When a Network Controller encounters an expired person record during its nightly system check, it shall modify that person record from “Active” to “Expired”. Similarly, if an expired person record is set to “Temporary”, it shall be changed to “Temporary Expired”.

1) To reactivate “Expired” and “Temporary Expired” credentials, a system user with appropriate user role permissions may edit the person record in the User Interface, and modify the expiration date to a future date/time. Once the record is saved, the person record status will be changed to “Active” or “Temporary”.

h. It shall be possible to specify that any credential not used within a specific number of days from the date it was issued will be disabled automatically.

i. To ensure that all new and modified credentials have expiration dates, a user with Setup privileges can enable a credential expiration requirement option for the system. When this option is enabled, users will be prevented from saving new and modified credentials that do not have expiration dates. The API shall enforce this by requiring that a valid expiration date be passed when a command is issued to add or modify a credential.

j. The “First Name”, “Middle Initial”, and “Last Name” fields of each Person Record shall allow for up to 50 characters each.

k. The system shall provide for a workflow to be configured to facilitate processing of lost and/or forgotten credentials.

l. The system shall track credential status information and make it available for use in creating up-to-the-minute credential status reports.

9. Enrolling new people:

a. All person data entered into the system shall be held in the system database and shall be available only to system users holding at least an Administrator user role.

b. Person data can be added, deleted, and edited by users holding at least an Administrator user role.

c. The system shall support person record templates.

1) Each template defines values for specific fields, such as a default set of access levels.
2) These values will be filled in automatically in any person record created from the template.
3) When adding a person to the system, a user shall be able to use one of the available templates in the active partition to create the person record, or create it without a template.
4) Person Record Templates shall be available for use in custom People report definitions and in person search criteria.

10. Creating Photo IDs - The system shall include an integrated photo ID function. It shall be possible:

    a. To design badge layouts.

    b. To upload badge layouts for badge printing.

    c. To capture ID photo images, print badges, and delete uploaded badge layouts.

    d. For the system user to manage all photos ID functions entirely from within the browser.

    e. To track the number of times a badge has been printed.

    f. To print multiple badges at once using the Badge Print Workflow.

    g. To enroll a person's card number manually or through a reader and save the new credential from the Badge Print Workflow.

    h. The system shall be capable of automatically generating auto-incremental encoded credential numbers. Each new encoded credential number shall be increased by one over the next highest number in the system.

11. Configuring network resources:

    a. S2 Cumulus registration – The system shall support the registration of an SMS with S2 Cumulus to support cloud-based monitoring and administration of the system from a single management dashboard.

    b. Microsoft Active Directory Data Synchronization – It shall be possible to configure an Active Directory (AD) server for data synchronization:

        1) Each S2 NetBox shall support up to 10 AD server connections.

        2) A user with the Full System Setup role shall have the ability to create up to 10 configurations for synchronizing data, with the same AD server or with different AD servers.

        3) Each configuration shall allow the synchronization of: (1) person attribute values stored on the AD server with values displayed in person records on the S2 NetBox, and (2) security group assignments on the AD server with access level assignments on the S2 NetBox.

    c. Microsoft Active Directory User Authentication – It shall be possible to configure an Active Directory (AD) server for user authentication:

        1) The configuration shall provide single user-login capability.

        2) Password rules and authentication will be governed by the AD server.

    d. Domain Name Servers (DNS) - The system shall support setting IP addresses for up to two domain name servers.

    e. Email settings - The system shall support the use of email notifications of alarm events.

1) The system user must setup the email server IP address or DNS name and the email address of the Network Controller.

2) A network administrator must setup the network mail server to relay email for the IP address of the Network Controller.

3) When setting up an email relay, users shall be able to select a port number other than 25 to indicate that the system should attempt to use encrypted SSL connections for the outgoing messages. If an encrypted connection is not available, then the system will fall back to port 25 for an unencrypted connection.

f. File Transfer Protocol (FTP) - The system shall support the use of an FTP or SFTP Server for backups. Once configured, backups are automatically saved to the FTP server on a daily basis.

g. Network Attached Storage (NAS) - The system shall support the use of NAS for network storage of backups and Data Operations Import files. Once configured, the system data is saved to a network storage location on a daily basis.

1) The network administrator must create a domain user account for the Network Controller and a password.

2) The system user must configure the network attached storage in the system, including the domain name, server IP address, share name, and the directory where the Network Controller may store data.

3) The system user can select a security protocol (ntlm, ntlmi, ntlmv2, ntlmv2i, ntlmssp, or ntlmsspi) to be used for authentication when communicating with the remote server.

4) The system user can also select the version of the Server Message Block (SMB) network file sharing protocol the NAS is set to use.

h. Time sever – It shall be possible for a system user to set up a primary Network Time Protocol (NTP) server and, optionally, secondary and tertiary NTP servers. The Network Controller's use of an NTP server will ensure the system will be synchronized regularly with the exact time used by all other network resources.

i. Remote logging – It shall be possible for a system user to set up remote logging. This will ensure that messages generated by the SMS will be forwarded to a remote host running the Rsyslog daemon.

j. A system user holding at least a Setup user role shall be able to configure network resources. Configuring an Active Directory server for data synchronization requires the Full System Setup user role.

12. Data Operations:

a. View – Users having the "Data Operations: View" user role permission shall be able to view the results of data operations. Depending on which other user permission roles assigned to them, they may also be able to add person records (including access level, credential, and user defined person record information) to the SMS, and modify and delete existing person records.

b. Import File – Shall enable the user to manually upload (import) tab-separated or comma-separated (CSV) text files.

c. Export File – Shall enable the user to manually download (export) CSV text files.

d. Automatic Import – Shall enable the system to process an Import File at scheduled intervals from a pre-configured NAS location.

e. Automatic Backups – Shall support the use of network attached storage (NAS) devices for automatic backup of Data Operations Import files to a network storage location.

f. Person Record Management – Data Operations shall provide the user interface to import person record CSV data to the S2 NetBox SMS. Data Operations shall also be the interface for exporting the complete set of current access level and credential configuration of existing person records from an S2 NetBox SMS to an external target system.

2.5 MAGIC MONITOR INTEGRATION

A. The S2 Magic Monitor Network Security Management System shall provide a single client management application for the security system.

B. S2 Magic Monitor shall integrate with S2 NetBox SMS systems.

C. S2 Magic Monitor software shall be available to be installed as a native client.

1. Supported Operating Systems

a. Windows 10

b. macOS Sierra

c. macOS High Sierra

D. The S2 Magic Monitor appliance shall be available as a single monitor/TV appliance or a multi-monitor solution.

E. The S2 Magic Monitor solution shall provide the ability to operate in a secure access mode that requires the application to use existing credentials from the S2 NetBox or S2 NetVR and shall not require duplication of users

1. Login credentials shall be able to be managed as a single credential over the video, access-control and S2 Magic Monitor client operations.

2. S2 Magic Monitor software shall provide a standalone mode with no requirement to authenticate with the S2 NetBox and shall provide the ability to add network video recorders and access controllers with local credentials.

3. Security of the data communicated over the network to and from the S2 Magic Monitor software shall be protected by encryption (SSL 128-bit) or authentication (TLS).

4. S2 Magic Monitor shall provide the ability to be set as an active client for video, access control and event management or as a standalone remote managed screen for video and public safety notifications.

F. S2 Magic Monitor shall provide the ability to search for person records in SMS systems, and to view, edit, and add person records, based on the user's permissions on these systems.

G. S2 Magic Monitor shall provide live real-time monitoring of access-control activity data, and video verification in real time over local and wide area networks.

H. S2 Magic Monitor shall provide the ability to view recent activity at a portal defined on an SMS, and to momentarily unlock a portal, based on the user's permissions on the SMS.

I. S2 Magic Monitor shall provide the ability to show video based on access control activity, live or recorded, and the option to view image from the card holder database based on the access control activity.

J. S2 Magic Monitor shall support simultaneous access to video, data, alarms and events from multiple servers.

K. S2 Magic Monitor shall support ability to span client into multiple direct attached monitors.

L. The S2 Magic Monitor client shall show live operation video, access control data, pop up events and push notifications, and life safety or any other digital signage graphics.

M. S2 Magic Monitor shall allow for the creation of custom layouts, including up to 400 cells.

N. S2 Magic Monitor shall be able to manage multi-media content:

1. Video Streams
2. Access Control Activity
3. Cardholder Images
4. Images to be used in digital signage [.jpg and .png]
5. Video Clips [MP4 and MOV]
6. Date and Time
7. Weather
8. Traffic
9. Information from private and public RSS feed
10. Twitter® feeds
11. Pandora® Radio
12. YouTube TV
13. Web content

14. Text

2.6 VIDEO MANAGEMENT SYSTEM INTEGRATION

A. General: The SMS shall support the integration of certain Network Video Recorders (NVR). This integration shall allow the viewing of live streaming video in the browser interface and recorded video playback. Viewing live streaming video shall require the Java™ 2 Runtime Environment version 1.4.2 or version 5.0.

1. Events in the alarm subsystem can initiate video recording. Video motion detection and camera up/camera down messages from the VMS can initiate alarms.

2. It shall be possible to monitor DVR and NVR cameras in the same views as direct IP cameras. VMS events shall be logged in the system Activity Log. It shall be possible to view recorded video of events from the Activity Log.

3. It shall be possible to view live cameras through floor plans, on the camera view pages, on the Monitoring and Widget Desktops.

4. It shall be possible to pull up recorded video through reports.

B. S2 NetVR Appliances (S2 NetVR and S2 NetBox VR):

1. S2 NetVR appliances must integrate with S2 Security systems access control, event monitoring, and video management into a single user interface for: live viewing, forensic searching and video exporting.

2. S2 NetBox VR should be a fully self-contained video management appliance or a one box unit with both an access control system and video management appliance, also containing a database, an operating system and application software, as well as raw video storage.

3. Multiple S2 NetVR appliances can be connected to Network Controllers as follows:

a. Up to 4 subordinate S2 NetVRs supporting up to 256 cameras, with one S2 NetBox system

b. Up to 3 subordinate S2 NetVRs supporting up to 16 cameras with one S2 NetBox VR system

c. Up to 16 subordinate S2 NetVRs supporting up to 1024 cameras with one S2 NetBox Extreme system

d. Up to 64 subordinate S2 NetVRs supporting up to 4,096 cameras with one S2 Enterprise 50 system

e. Up to 128 subordinate S2 NetVRs and 4,096 cameras with one S2 Enterprise 100 system

4. Shall use browser-based functionality with the use of an installed video accelerator

5. Natively supports up to 128 cameras

6. Shall support video surveillance features, including:

a. Real-time surveillance video integrated on the home page, the Monitoring Desktop, and the Widget Desktop

b. Viewer-adjustable single camera and multi-camera views (2x2 or 1+7), presets, and camera tours

c. Calling up cameras through events and through floor plans

d. Adjust camera with PTZ controls, enabled through UI controls, using mouse or joy stick

e. Adjust video quality and frame rate in video viewer

f. Browse video from anywhere that has permitted access to the network and has the accelerator installed

g. Displays a blue border by default or custom color border when there is motion in the frame

h. Provides the ability to organize surveillance tools using favorite cameras, camera categories, and change sort order.

7. Network Address Translation (NAT): SMS system users shall be able to configure NAT settings for an S2 NetVR that is behind a NAT device. NAT allows multiple devices on a private network to be mapped to a single IP address.

8. Disk Management: SMS system users shall be able to view storage drives that have been installed in an S2 NetVR appliance, and adopt drives into S2 NetVR so it can begin using them for video storage.

C. Third-party Video Integration Functionality:

1. Third party VMS integration shall be performed by using the S2 Open Video Interface Document (OVID)

2. A TCP/IP connection shall be established between the SMS and the third-party VMS.

3. The Integration shall support:

a. Trigger video recordings

b. Trigger preset commands

c. PTZ control

d. Recalling recorded video

e. Motion events

f. Video loss events

g. Video restore events

4. Integrated DVR/NVR Systems:

a. Cisco – VSOM

b. Exacq – exacqVision – 8.4.1

c. Milestone Systems – Professional, Expert & Corporate 2016 and 2017

d. OnSSI – Ocularis 5.3

e. Salient Systems - CompleteView NVR 3.5.2

f. Video Insight - Enterprise Video Management Software 4.3

g. Avigilon - Avigilon Control Center (ACC) 6

5. Open Video Interface Driver (OVID) API:

a. This specification defines an API to implement the integration of video surveillance systems with the SMS.

b. The OVID API shall allow users to monitor and control one or more video servers along with their associated video cameras, to augment the physical security devices (door locks, card readers, etc.) controlled by the SMS.

c. The integrated system shall be controlled through a web browser user interface which presents an integrated view of both the SMS and the video surveillance system.

2.7 MERCURY AND MERCURY POWERED HARDWARE INTEGRATION

A. The SMS shall support the integration of access control hardware from Mercury Security Corp.

B. Mercury EP Series Devices: The following hardware components shall work with the Network Controller:

1. Supported Mercury EP-Series Panels:

a. EP2500: Intelligent Controller: 32MB RAM, Ethernet

b. EP1502: Intelligent Dual Reader Controller: 16MB RAM, Ethernet, 2 readers) 8 inputs, 4 relays

c. EP1501: Intelligent Single Door Controller: PoE, single door, 2 readers, 2 inputs, 2 outputs

d. Mercury firmware version 1.23.6 is supported on the above panels.

2. Supported Mercury Interface Boards (SIOs):

a. MR-50 Reader Interface Module (Series 2 and 3): 1 reader (magnetic stripe or Wiegand), 2 inputs, 2 relays

b. MR-52 Reader Interface Module (Series 2 and 3): 2 readers (magnetic stripe or Wiegand), 8 inputs, 6 relays

c. MR-16in Input Monitor Module (Series 2 and 3): 16 inputs (zones), 2 relays

d. MR-16out: Relay Output Control Module (Series 2 and 3): 16 relays

C. Mercury M5 Bridge Devices: The Mercury M5 Bridge hardware platform uses legacy Mercury Casi Micro/5 enclosures retrofitted with Mercury M5 and MR devices to replace existing Casi devices. The following Mercury hardware components shall work with the Network Controller:

1. Supported Mercury M5 Bridge Panel:

a. M5-IC - intelligent control device for the replacement of the Casi PX, PXN, and PXNplus CPU controllers

2. Supported Mercury Interface Boards (SIOs):

a. MR-50 Reader Interface Module (Series 2 and 3): 1 reader (magnetic stripe or Wiegand), 2 inputs, 2 relays

b. MR-52 Reader Interface Module (Series 2 and 3): 2 readers (magnetic stripe or Wiegand), 8 inputs, 6 relays

c. MR-16IN Input Monitor Module (Series 2 and 3): 16 inputs (zones), 2 relays

d. MR-16OUT: Relay Output Control Module (Series 2 and 3): 16 relays

e. M5-2K - multi-device interface panel for the replacement of the Casi M2000 reader controller

f. M5-2RP - multi-device interface panel for the replacement of the Casi 2RP reader control device

g. M5-2SRP - multi-device interface panel for the replacement of the Casi 2SRP reader control device

h. M5-8RP - multi-device interface panel for the replacement of the Casi 8RP reader control device

i. M5-16DO - multi-device interface panel for the replacement of the Casi 16DO output control device

j. M5-16DOR - multi-device interface panel for the replacement of the Casi 16DOR input control device

k. M5-20IN - multi-device interface panel for the replacement of the Casi 20DI input control device

l. MUX8 – multi-device interface panel for the replacement of the Casi M Series 8RP to a single communications port

m. CASI F2F readers and keypads shall be supported for Mercury M5 Bridge 2RP, 2SRP, and 8RP panels

3. Schlage Wireless Devices: Mercury connected Schlage AD-400 wireless locks and WRI400 wireless access point modules via PIM-400 module.

4. Honeywell PW-Series Devices: Mercury powered PW-Series devices controlled and connected to intelligent control module PW6K1IC.

D. Support for OSDP readers: When configuring readers for Mercury SIOs, users can enable the Open Supervised Device Protocol (OSDP). For readers that support AES 128-bit encryption, users shall be able to enable encryption as well. OSDP shall allow for tamper and disconnect actions, which can trigger events.

E. Support for alternate readers: When configuring a reader, a user shall be able to specify that it will be used only as an alternate reader for an elevator on a Mercury board. Although access to the elevator will be associated with the elevator's primary reader, cardholders will be able to request access at either of the elevator's readers.

2.8 OTIS ELEVATOR COMPASS SYSTEM INTEGRATION

A. The system shall support the integration of the Otis Elevator Compass™ Destination Entry System with the S2 NetBox, S2 NetBox Extreme, S2 NetBox Enterprise 50, and S2 NetBox Enterprise 100 systems. The Compass system is designed to optimize the use of elevators in large office buildings.

1. The boundary between the Compass network and the SMS network is a Layer 3 switch. This switch routes two-way data traffic between the Network Controller and the nodes in the Compass system, using the TCP/IP networking protocol.

2. The Network Controller acts as the central processor for the security system. A single Controller can supervise the operation of many Compass nodes. It also manages all communication between the SMS and the Compass system.

3. The Network Node is a peripheral processor which handles building security hardware such as card readers. A Compass node can control many readers.

4. Once the system has been initialized to support an interface to the Compass system, standard SMS configuration pages can be used to configure the Compass system:

   a. The Status page lets users view the Compass IP network configuration information, such as Compass node status.

   b. The Floor Map page lets users configure the floor mapping needed to identify the building floors by name and floor.

   c. The Configuration page lets users configure the destination entry server (DES) nodes, destination entry director (DER) nodes, and destination entry computer (DEC) nodes in the Compass system.

   d. The Events page lets users view the IP address, name, node type, and status of each node in the Compass system.

   e. The Reader Groups and Access Levels pages let users configure reader groups and their associated access levels within the Compass system.

2.9 ALLEGION ENGAGE REMOTE DEVICE INTEGRATION

A. The S2 NetBox, S2 NetBox Extreme, S2 NetBox Enterprise 50, and S2 NetBox Enterprise 100 Security Management Systems shall support the integration of the following Allegion ENGAGE devices:

   a. Schlage NDE Series (cylindrical) and LE Series (mortise) Wireless Locksets – used for access control in commercial, institutional, and multi-family facilities.

   b. Schlage BE Series (deadbolt only) and FE Series (lever and deadbolt) Control Locksets – used for access control in residential properties.

   c. Von Duprin RM/RU (Remote Monitor/Remote Undog) exit devices – used for mass access control, and do not have physical readers or user databases.

B. Schlage Wireless Locksets are managed by the SMS through the ENGAGE Gateway. Locks communicate to the ENGAGE gateway using Bluetooth.

   1. The following resource limits shall be supported:

a.	Access levels	16
b.	Credentials	NDE/LE Locksets: 5,000, Control Locksets: 500
c.	Portal group unlock time specs	8 per week (NDE/LE Locksets only)

   2. The system shall support 1000 ENGAGE locksets; each Network Controller configuration shall be rated for the number of Locksets it can support.

   3. Once an ENGAGE Lockset is installed and linked to the ENGAGE Gateway, and the Network Controller has connected to the ENGAGE Gateway, the Lockset appears in the security application as a “remote lockset”, which can be enabled and configured to work with the Controller.

   4. When an ENGAGE Gateway connects to the Network Controller, it shall report its serial number and firmware version. It shall also report its linked Locksets, the battery voltage of each Lockset, and the signal quality between the Lockset and the Gateway.

   5. The ENGAGE Gateway shall connect to the Network Controller via IP and shall not require the use of third-party hardware as an intermediary between the ENGAGE Gateway and the Network Controller.

   6. It shall be possible to configure the reader and portal that were automatically created for an ENGAGE Lockset.

   7. It shall be possible to specify special-use formats for access cards to be used with ENGAGE Locksets.

   8. Supported credential modes shall include:

      a. Emergency Open. A cardholder with an Emergency Open credential can open any ENGAGE Lockset portal to which he or she has access when the portal is in Lockdown mode. The cardholder can also use the credential to open any regular portal to which he or she has access, if access is not constrained by a portal unlock time spec.

b. Toggle Passage Mode. A cardholder with a Toggle Passage Mode credential can toggle any ENGAGE Lockset to which he or she has access between the locked and unlocked states. The cardholder can also use the credential to open any regular portal to which he or she has access, if access is not constrained by a portal unlock time spec.

9. The ENGAGE Lockset shall be able to send high priority events to the Network Controller.

10. It shall be possible to schedule an automatic unlock period for ENGAGE Lockset portals. The start of this period can be triggered by time.

11. It shall be possible to configure a Tamper event for the ENGAGE Lockset. The event will be triggered when the Lockset tampering is detected.

12. It shall be possible to configure a Magnetic Tamper event for the ENGAGE Lockset. The event will be triggered when door position sensor tampering is detected.

13. It shall be possible to configure a Critical Battery event for the ENGAGE Lockset. The event will be triggered when the battery voltage <= 4.0V.

14. It shall be possible to configure a Low Battery event for the ENGAGE Lockset. The event will be triggered when the battery voltage <= 4.5V.

15. It shall be possible to configure an ENGAGE Lockset for Office, Privacy, Apartment, or Storeroom mode as appropriate, based on the model of the Lockset.

16. ENGAGE Locksets shall have the following additional capabilities:

    a. ENGAGE Locksets can be assigned to locations; changes to a location's threat level can cause the locksets in that location to enter and exit lockdown mode.

    b. ENGAGE Locksets shall have momentary unlock capability while in lockdown mode (by means of an event action or button on the portal status page).

    c. ENGAGE Locksets shall be capable of persistent unlock or lock mode (by means of an event action or button).

    d. ENGAGE Locksets can be added and managed in floorplans.

    e. ENGAGE Locksets can be unlocked momentarily via event actions or from the Portal Status page, the Widget Desktop, the Monitoring Desktop, or a floorplan.

    f. ENGAGE Locksets shall perform scheduled locks or unlocks via, event actions, or from buttons on the Portal Status page, the Widget Desktop, the Monitoring Desktop, or a floorplan.

    g. ENGAGE Locksets shall be capable of being switched to a locked or unlocked state, and be disabled or enabled using buttons on the Portal Status page.

    h. ENGAGE Locksets shall be capable of being enabled and disabled via buttons on the Portal Status page.

    i. Activity associated with an ENGAGE Lockset can be viewed in real time in the Activity Log.

17. ENGAGE RM/RU exit devices shall have the following additional capabilities:

    a. A portal with ENGAGE RU exit device shall be capable of being switched to the locked or dog-on-next-exit (DNE) state from any previous state. This can be accomplished manually via a Dog the Portal action or automatically via a scheduled action or portal group time spec.

2.10 ASSA ABLOY REMOTE LOCKSET INTEGRATION

A. The SMS shall support the integration of ASSA ABLOY Wi-Fi enabled locksets (models v.S2, p.S2, and IN120) and PoE locksets (models v.S1, p.S1, and IN220).

1. The system shall support more than 500 remote locksets; each Network Controller configuration shall be rated for the number of locksets it can support.

2. Once a lockset is installed and registered with the Network Controller, it appears in the security application as a “remote lockset” node, which can be enabled and configured to work with the Network Controller.

3. When a remote lockset connects to the Network Controller, it shall report its power type, which is encoded in its serial number.

    a. A lockset reporting having PoE or direct hardwired power shall be treated as an online lockset and assigned the Default (Online) lockset profile.

    b. A lockset reporting having only batteries as a power source (such as a Wi-Fi lockset) shall be treated as an offline lockset and is assigned the Default (Offline) lockset profile.

    c. The offline remote lockset shall update the Network Controller with the current voltage level of its battery upon each connection.

    d. Clearing the “Online” check box on the Advanced tab of the Network Nodes page will change an online lockset communication status to offline.

    e. The default lockset profile automatically assigned to the lockset the first time it connects to the system shall be editable.

4. It shall be possible to set configuration options for a remote lockset to change its call-in and unlock behaviors.

5. It shall be possible to configure the reader and portal that were automatically created for a remote lockset.

6. It shall be possible to view cached information for a remote lockset, for troubleshooting purposes.

7. It shall be possible to specify special-use formats for access cards to be used with remote locksets.

8. The remote lockset shall be able to send high priority events to the Network Controller.

9. It shall be possible to schedule an automatic unlock period for remote-lockset portals. The start of this period can be triggered by time or by an initial valid card read.

10. It shall be possible to select a check box when creating a magnetic stripe ABA Track 2 card format to ensure that the format will be recognized by remote locksets with magnetic stripe card readers.

11. It shall be possible to create remote lockset profiles to assist in the configuration and management of large numbers of remote locksets. A lockset profile is a defined set of attributes that affect lockset behaviors. Assigning a profile to a lockset gives it the attributes defined in the profile. Any subsequent changes made to the profile are applied to the lockset automatically.

12. Locksets shall support PIN-only credentials.

13. It shall be possible to specify a voltage level below which an offline lockset will go into power saving mode. If a Low Battery event is enabled for the lockset, the event will be triggered. Once the battery is replaced, the lockset will leave power saving mode only when the voltage level reaches 1.5 Volts higher than its current Low Voltage setting.

14. It shall be possible for a lockset to check for permissions with the host (controller) for a person that is not yet stored in the lockset.

15. Online locksets shall have the same capabilities as offline locksets with the following additional capabilities:

    a. Online locksets can be assigned to locations; changes to a location's threat level can cause the locksets in that location to enter and exit panic mode.

    b. Online locksets shall have momentary unlock capability while in panic mode (by means of an event action or button on the portal status page).

    c. Online locksets shall be capable of persistent unlock or lock mode (by means of an event action or button).

    d. Online locksets can be added and managed in floorplans.

    e. Online locksets can be unlocked momentarily via event actions or from the Portal Status page, the Widget Desktop, the Monitoring Desktop, or a floorplan.

    f. Online locksets shall be capable of performing scheduled locks or unlocks via, event actions, or from buttons on the Portal Status page, the Widget Desktop, the Monitoring Desktop, or a floorplan.

    g. Online locksets shall be capable of being switched to a locked or unlocked state, and be disabled or enabled using buttons on the Portal Status page.

    h. Online locksets shall be capable of being enabled and disabled via buttons on the Portal Status page.

    i. Activity associated with an online lockset can be viewed in real time in the Activity Log.

2.11 S2 MOBILE SECURITY PROFESSIONAL™

A. S2 Mobile Security Professional (S2 MSP) shall be a mobile application for use with Apple iPad tablets and Apple iPhone running iOS 10 and later and Android devices running 4.4 and later. S2

MSP shall enable wireless tablet users to monitor and control various features of the SMS. It shall be possible to view multiple S2 NetBox controllers that are connected to a single S2 MSP.

1. Activity Monitoring – Users shall be able to view recent activity from the SMS Activity Log. Users shall be able to select specific Activity Log entries to view associated records, such as person record details, play live and recorded video, and change the status of specific portals.

2. View Person Details – Users shall be able to search for persons by name, and view associated person records. Users shall be able to photograph persons using the camera on their tablet or phone, and record these in the SMS.

3. Live Video Monitoring – Users shall be able to display thumbnail images of every S2 NetVR camera view integrated with the SMS. Users shall be able to select individual thumbnails, which shall display live video from the corresponding camera.

4. Mobile Mustering - The application shall support a mustering process using a mobile device to allow regional evacuation, unimpeded by access control constraints. Users shall be able to initiate and terminate multiple evacuations simultaneously. The system shall enable users to determine if all persons known to be present within a given region have been accounted for. The system shall be capable of managing mustering points simultaneously.

5. Photo ID Capture - Takes an ID photo directly from the app.

6. Portals - Enables momentary unlock of any portal in the system. Portals shall also show the live video of the camera associated with the portal.

2.12 THIRD PARTY SSL CERTIFICATE SUPPORT

A. It shall be possible to configure an SSL certificate that will provide encryption alone, or encryption plus authentication. The available options are:

1. Generating a self-signed SSL certificate, this is signed with the embedded web server's own private key. This certificate shall provide encryption but not authentication. Users will need to override their security warnings, or accept the certificate as trustworthy into their browser key ring.

2. Generating an SSL certificate that is signed by a certificate authority (CA). This certificate shall provide both encryption and authentication.

3. Uploading your own SSL certificate and matching key to the Network Controller. Optionally, it shall be possible to upload a chain, or intermediate, file that links the certificate to a trusted root certificate. This provides both encryption and authentication.

2.13 PIVCHECK INTEGRATION (HID)

A. The SMS shall support the integration of HID's PIVCheck PIV/TWIC/CAC/FRAC. This integration allows for:

1. Support for FIPS-201 Credentials

2. Authentication of PIV, TWIC, CAC, and FRAC credentials.

3. Validation against a certificate revocation list.

4. Enrollment of information contained within the credential imported directly into the S2 NetBox database.

2.14 VISITOR MANAGEMENT SYSTEMS INTEGRATION

A. The SMS shall be able to integrate with a variety of industry leading visitor management products. The integration allows for visitor information to be shared with SMS, providing the ability to assign credentials to visitors as well as running reports on activity. There is no additional cost or license fee from S2 for integrating with these visitor management systems with the SMS application.

B. The following visitor management companies have written integrations to the SMS using the NBAPI:

1. Jolly - Lobby Track

2. HID - EasyLobby

3. STOPware - PassagePoint

4. Veristream – iVisitor

5. Angus

6. ProxyClick

7. Splan

8. Envoy

C. Fees associated with integration of third-party visitor management systems may be applicable, depending on the manufacturer.

2.15 API INTEGRATION

A. An application programming interface (API) is provided for the S2 NetBox/S2 NetBox VR/S2 NetBox Enterprise SMS. The API provides programmatic access to the network-connected components managed by the SMS.

1. Communication between the SMS and another application takes place through the TCP/IP networking protocol. The API is invoked by posting an HTTP message to the web server on the Network Controller.

2. The SMS database includes a table of “people” whose records act as container objects for attributes attached to people in real life. People are mapped to access levels, which specify access privileges—and to access cards, whose credentials are used for access control.

3. Access levels are created in the system using the normal web user interface for the SMS. People and credentials may be entered into the system either through the web user interface or through the API.

4. It shall be possible to assign a custom user role that will allow a user to log into the SMS only through the API.

5. The API supports commands for:

    a. Adding, modifying, removing, and retrieving data about a person, and retrieving information about one or more people based on various search criteria.

    b. Adding, modifying, and removing credentials, and retrieving a list of the names of defined card formats.

    c. Adding, modifying, and deleting access levels, and retrieving a list of the valid access levels in the system.

    d. Adding, modifying, and deleting access level groups, and retrieving a list of the valid access levels groups in the system.

    e. Pinging the SMS to determine its health, and retrieving the current version of the API from the server.

    f. Retrieving a history of access activity, either for all users or for a particular access card.

    g. Adding, modifying, and removing threat levels and threat level groups, and setting the threat level in the system.

    h. Retrieving a list of portals and associated card readers defined for the SMS.

    i. Adding, modifying, deleting, and retrieving time specifications and time specification groups.

    j. Adding, modifying, and deleting holidays, and returning a list of holiday keys or a specific holiday.

    k. Adding, modifying, and deleting readers and reader groups, and returning a list of reader group keys or information for a specific reader group.

    l. Adding, modifying, and deleting portals and portal groups, and retrieving information about a specific portal group.

    m. Requesting events from the Activity Log that occurred within a specified time period. These events are returned from the API in the CSV Export report format.

    n. Activate or Deactivate Output: Requests that the output specified by an output key value be activated or deactivated.

    o. Momentarily unlocking the portal specified by a portal key value.

    p. Locking or unlocking the portal specified by a portal key value.

    q. Support for credential IDs, which are aliases for actual credential numbers. As a security measure, credential IDs can be retrieved and stored in a client system in place of the encoded numbers and/or hot stamps.

r. Adding, modifying, and deleting UDF value lists, and retrieving a list of the UDF value lists defined for the SMS.

s. Recording Access Granted and Access Denied events in the Activity Log, and inserting a user-defined event that displays a text string in the Activity Log.

2.16 HIGH AVAILABILITY (HA) SOLUTION

A. The system shall support S2's High Availability (HA) Solution. The HA Solution includes an HA server pair consisting of two S2 NetBox Enterprise 100 servers running Stratus Technologies everRun® Express high availability virtualization software. The servers act as a platform for the S2 software and operating system as a virtual machine on one server, which is continually backed up on the other server.

1. A Hot Standby implementation shall use a failover cluster consisting of a pair of identical co-located Network Controllers. One Controller shall have the primary, or active, role and the other a secondary or passive role.

2. The Hot Standby implementation shall support operation from either Network Controller, but not from both simultaneously. Under normal redundant operation, the primary Controller shall perform all operations and shall mirror its data onto the secondary Controller.

3. The two Network Controllers shall be linked by a heartbeat network connection they shall use to monitor and communicate with each other. They shall share a virtual IP address to be used for communications with Network Nodes and other devices.

4. Should the primary Controller fail, the secondary Controller shall be available to provide service through a process called failover. Administrators shall be alerted that a failover has occurred so they can take appropriate measures to restore the Hot Standby implementation.

2.17 S2 NETBOX OFFSITE RECOVERY

A. S2 NetBox offsite recovery shall support the ability to configure two Network Controllers in a primary/secondary configuration.

1. On the primary Network Controller, all Network Nodes shall be configured with a secondary Controller's IP address.

2. The Network Nodes shall initially connect to the primary Network Controller.

3. In a disaster recovery scenario in which the primary Network Controller becomes unavailable, the offsite recovery feature shall support a manual switchover command on the secondary Network Controller.

4. The switchover command shall only be able to be manually executed by an S2 administrator.

2.18 S2 CUMULUS® REMOTE MONITOR AND ADMINISTRATOR

A. The system shall support cloud-based monitoring and administration of S2 access control and video systems from a single management dashboard.

B. S2 Cumulus shall support S2 NetBox, S2 NetVR, S2 Global, and S2 Magic Monitor.

C. S2 Cumulus shall support remote monitoring of the following:

1. The last communication with Cumulus

2. Status of the CPU

3. Memory and network bandwidth usage

D. S2 Cumulus shall support the managing of system licenses, including:

1. OS version

2. S2 software version

3. SUSP expiration date

4. Detailed license information

E. S2 Cumulus shall support remote updating of the system's software

F. S2 Cumulus shall be accessible through the S2 Integrator Portal

G. S2 Cumulus shall not require ports to be opened for communications from the S2 NetBox, S2 NetVR, S2 Global, or S2 Magic Monitor.

H. S2 Cumulus shall support the sending of email or text alerts to system users when a system has an error.

1. Alerts shall be able to be grouped together

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine cable pathways including conduit, raceways, cable trays, and other pathway elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine rough-in for control cable and conduit systems to controllers, card readers, and other system components to verify conduit and back-box locations prior to installation of system devices

C. Examine available network capacity and support infrastructure. Consult with network administrator for compliance with network standards and capacity

D. Examine install location for compliance with space allocations, installation tolerance, hazards to safe system operation, and other conditions affecting installation

E. Examine roughing-in for LAN, WAN, and IP network before device installation

3.2 PREPARATION

A. Comply with SIA CP-01 Control Panel Standard.

B. Comply with ANSI/TIA-606-B Labelling Standard.

C. Prepare detailed project planning forms for programming and configuration of the SMS. Fill in all data available from project plans and specifications and publish as project planning documents for review and approval. These may include (but are not limited to):

1. Define SMS Partitions.

2. For each Location, record setup of Network Controller features and access requirements.

3. Propose start and stop times for time zones and holidays, and match up access levels for doors.

4. Set up groups, facility codes, software triggers, and list inputs and outputs for each Network Controller.

5. Assign action message names and compose messages.

6. Set up alarms. Establish trigger actions between events and video surveillance features.

7. Prepare and install alarm graphic maps.

8. Develop user-defined fields.

9. Develop screen layout formats.

10. Discuss badge layout options; design badges.

11. Complete system diagnostics and operation verification.

12. Prepare a specific plan for system testing, startup, and demonstration.

13. Develop acceptance test concept and, on approval, develop specifics of the test.

14. Develop cable and asset-management system details; input data from construction documents. Include system schematics and technical drawings in electronic format.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final programming and configuration documents. Use final documents to program and configure software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction".

B. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

C. Install LAN cables using techniques, practices, and methods that are consistent with Category 6 rating of components and fiber-optic rating of components, and that ensure Category 6 performance of completed and linked signal paths, end to end.

D. Junction boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with tamper resistant fasteners and/or tamper detection switches. In addition, hinged enclosure doors shall be equipped with locking hardware. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

E. Install end-of-line resistors at the field device location and not at the controller or panel location.

F. Card Readers and Keypads and Peripheral Devices:

1. Install number of conductor pairs recommended by device manufacturer for the functions specified.

2. Follow device manufacturer’s installation requirements for maximum cable distances and sizes.

3.4 IDENTIFICATION

A. Label, in plain English, each end of each cable, field panel, patch panel, network switch, or cabinet

1. Each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the device as shown

B. At completion, cable and asset management documentation shall reflect as-built conditions

3.5 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved.

B. Assign the software license(s) to Owner.

C. All default password shall be changed to those selected by the owner

1. The contractor shall retain no records of passwords for the project

3.6 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 components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Factory Commissioning: Onsite visit by the Manufacturer’s in-house personnel to inspect, test, and assess system programming, functionality, and performance.

D. Tests and Inspections:

1. Inspection: Confirm that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.

2. Pretesting: Configure and pretest system components, wiring, and functions to confirm that they comply with specified requirements.

3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements.

4. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least <14 days>. Provide a minimum of 10 days' notice of test schedule.

5. Operational Tests: Perform operational system tests to confirm that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. The system is considered defective and the project incomplete if it does not pass tests and inspections

F. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

B. Provide onsite visit by Manufacturer’s in-house personnel to train Owner’s operations personnel.

C. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

D. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.8 ADJUSTMENTS

A. Occupancy Adjustments: When requested within 30 days of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections

2. Confirm system configuration and adjust settings needed

3. Recommend changes to the system to improve Owner's use

4. Provide a written report of adjustments and recommendations

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the system equipment.

B. Develop and provide separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.

2. Operators who prepare and input credentials, monitor the SMS, and to enroll personnel.

3. Security personnel.

4. Hardware maintenance personnel.

5. Corporate management.

3.10 MAINTENANCE

A. The Contractor shall offer a Software Upgrade and Support Agreement (SUSP)

1. The Contactor shall offer the SUSP in 1 year, 3 year, and 5 year increments.

2. As part of the agreement, normal business hours (7:00 AM – 5:00 PM), manufacture phone support shall be available.

3. The option of 24/7 telephone support shall be offered.

4. As part of the agreement, access to software patches and software upgrades shall be available.

END OF SECTION

SECTION 28 16 00

DISTRICT STANDARD INTRUSION DETECTION SYSTEM

PART 1- GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install a complete Intrusion Detection system. The Intrusion Detection system shall be microprocessor-based, network capable and complete with an integral DACT and a Network Interface Card. The Intrusion Detection system shall be capable of providing, at a minimum, the following:
   1. Intrusion Detection Panel
      a) Integral Digital Alarm Communications Transmitter (DACT).
      b) Network Interface capability via the District Wide Area Network.
   2. Addressable initiation devices
   3. Addressable control modules
   4. Notification Appliances
   5. Remote Power Supplies
   6. On-site or remote video monitoring
   7. Temperature threshold detection and monitoring
   8. Humidity threshold detection and monitoring
   9. Pressure threshold detection and monitoring
   10. Power loss detection and monitoring, generator switching
   11. Leak detection and monitoring
   12. Carbon monoxide detection and monitoring
   13. Tank level threshold detection and monitoring
   14. Integral Card Access Control System
   15. Central Station Monitoring connection via owner provided copper telephone line

B. Contractor shall furnish all labor, materials, appliances, tools, equipment, facilities transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the applicable Contract Drawings and/or specified herein.
   1. This specification document provides the requirements for the installation, programming, and configuration of a complete Command Processor Panel System. This system shall include, but not be limited to:
      a) Control panel
      b) System cabinet
      c) Power supply
      d) Single and multi-zone expansion modules
      e) Addressable initiating bus (LX Bus)
      f) Keypad Bus
      g) Hard-wired zone cabling
      h) Batteries
      i) Conduit
         1) All required conduit and/or raceway shall be provided by the electrical contractor
      j) Associated peripheral devices
      k) Other relevant components and accessories required to furnish and install a complete and operational system.

C. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this Specification.

D. The installing contractor shall be the Factory Authorized Distributor of both the Intrusion Detection. Submittals provided by any contractor who is not so qualified shall be rejected.
   1. Contractor shall coordinate with the District or its representative to obtain one telephone line for monitoring and system management.

E. **By submission of a Prime Bid for this project, the Prime Bidder assumes complete and total responsibility for himself and his subcontractors' compliance with this specification in its entirety. If found to be not in compliance with any part of this specification, the Prime Bidder shall bear any burden, financial or otherwise, required to complete the work of this specification to the total satisfaction of Los Alamitos Unified School District.**

1.02 QUALIFICATIONS

A. Equipment
   1. **This specification is based on the equipment of the manufacturer who's equipment is the District Standard for Intrusion Detection. No substitutions shall be accepted.**
   2. **The Intrusion Detection equipment specified as Digital Monitoring Products (DMP).**
   3. All equipment shall conform to applicable codes and ordinances.
   4. All equipment shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as Intertek Testing Services NA, Inc. (ITSNA - formerly ETL) or Underwriters Laboratories Inc. (UL) and be listed by their re-examination service.

B. System Supplier/Installer
   1. The system shall be provided and installed by the Manufacturer's Authorized Distributor who is trained and certified by the Manufacturer in the proper installation, programming, service and maintenance of the system.
      a) Upon demand, the bidding Prime Contractor shall provide the following qualification documentation for the System Supplier/Installer whether it be himself or his subcontractor regardless of tier. Failure to provide the documentation listed below upon demand by the District or its representative shall be cause for disqualification of the Prime Contractor's entire bid.
         1) The System Supplier/Installer shall provide proof of current status as the Manufacturer's Authorized Distributor in good standing.
         2) The System Supplier/Installer shall provide proof that a minimum of four (4) technicians have attended and completed all requirements and received certification from the manufacturer's installation and service school.
         3) The System Supplier/Installer shall provide proof that his company has been continuously engaged in the business of providing alarm systems on school projects in the Orange County area for a minimum of fifteen (15) years.
         4) System Supplier/Installer shall provide a list of five (5) immediately verifiable Orange County School District references complete with names and telephone numbers.
         5) System Supplier/Installer shall provide a list of twenty (20) on-going or completed projects of type indicated in the contract documents. Five of these shall be projects of similar size and scope to the project indicated in the bid documents and all must be immediately verifiable. For the purposes of this qualification, projects completed more than five years past shall not be acceptable.
         6) The System Supplier/Installer shall hold valid State of California Contractor's Licenses, C-10 and C-7.
         7) The System Supplier/Installer shall hold a valid State of California Alarm Company Operator License, ACO.
         8) The System Supplier/Installer shall provide proof that they maintain a complete service and maintenance center within 50 miles of the project address. A complete service center shall include replacement parts in stock in the quantities deemed sufficient by the owner or its representatives.

9) The System Supplier/Installer shall be prepared to offer a service contract for the maintenance of the system beyond the warranty period.

1.03 RELATED SPECIFICATIONS

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the Division 1 - General Requirements specifications are hereby made a part of this Section.
   1. Section – 26 00 00 General Electrical Requirements
   2. Section- 27 05 26 – Bonding and Grounding
   3. Section 26 05 19 – Building Wire and Cable
   4. Section 26 05 33 – Raceways and Boxes

B. RELATED WORK BY OTHERS
   1. Reference Part 3, sub-section 3.01 of this specification.

1.04 APPLICABLE CODES & STANDARDS

A. The intrusion detection/access control system shall comply with the applicable provisions of the currently adopted versions of the following codes and standards.
   1. Building Standards Administrative Code, Part 1, Title 24, California Code of Regulations
   2. California Building Code (CBC) Part 2, Title 24, California Code of Regulations (Uniform Building Code, Volumes 1, 2 & 3 with California Amendments)
   3. California Electrical Code (CEC) Part 3, Title 24, California Code of Regulations (National Electrical Code with 2001 California Amendments)
   4. California Fire Code (CFC) Part 9, Title 24, California Code of Regulations (Uniform Fire Code with California Amendments)
   5. National Fire Protection Association (NFPA) standards:
      a) NFPA 70, National Electric Code
      b) NFPA 110, Standard for Emergency and Standby Power Systems
      c) NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems
      d) NFPA 780, Standard for the Installation of Lightning Protection Systems

B. ADA - Americans with Disabilities Act

C. CAC – California Administrative Code, Title 24

D. U.L. Standards
   1. The system shall comply with the applicable provisions of the following U.L. Standards:
      a) UL 294, Standard for Access Control Systems Units
      b) UL 609, Standard for Local Burglar Alarm Units and Systems
      c) UL 634, Standard for Connectors and Switches for Use with Burglar-Alarm Systems
      d) UL 636, Standard for Holdup Alarm Units and Systems
      e) UL 639 Standard for Safety for Intrusion Detection Units
      f) UL 681, Standard for the Installation and Classification of Burglar and Holdup Alarm Systems
      g) UL 1076, Standard for Proprietary Burglar Alarm Units and Systems
      h) UL 1610, Standard for Central Station Burglar Alarm Units
      i) UL 1635, Standard for Digital Alarm Communicator System Units
      j) UL 2044, Standard for Commercial Closed Circuit Television Equipment

1.05 SUBSTITUTIONS

A. **No substitutions shall be accepted.**

1.06 SUBMITTALS

A. Within thirty-five (35) calendar days after the date of the award of the contract, the Contractor shall submit to the Architect for review, one (1) electronic (PDF) copy of a complete Submittal Package. The Submittal shall consist of the following sections, with each section separated with index tabs.
   1. Title Page

a) Project Title
b) Project address
c) Architect's name and address
d) Contractor's name and address

2. Certifications
   a) Index of Certification Section Contents
   b) Valid State of California Contractors License
   c) Manufacturer's Certifications
      1) Authorized Distributor
      2) Factory Trained Technician
3. Project List
   a) A substantial list (minimum of 20) of completed projects equal in scope to that specified herein.
      1) Contact information shall be made available upon request.
4. Product Data
   a) Index of Equipment Data Sheets
   b) Manufacturer's Data Sheets including cable types
   c) Applicable Listings and Approvals
5. Shop Drawings
   a) Shop Drawings shall not be required for this system on this project regardless of notes on the plans.

PART 2– PRODUCTS

2.01 SYSTEM REQUIREMENTS

A. Component Enclosure
   1. Housings; power supply enclosures, terminal cabinets, control units, and other component housings, collectively referred to as enclosures shall be so formed and assembled as to be sturdy and rigid. If sheet steel is used in the fabrication of enclosures, it shall be not less than an 18 gauge door with a 20 gauge box frame. Where exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent ready removal. Doors having a latch edge length of less than 24 inches shall be provided with a single lock keyed to the District Standard lock for Intrusion Detection/Access Control Cabinets

B. Electronic Components
   1. All system electronic components shall be solid-state type, mounted on printed circuit boards. Light duty relays and similar switching devices shall be solid-state type or electromechanical.
   2. The panel shall have an over-current notification LED that lights when devices connected to the Keypad Bus and LX-Bus(es) draw more current than for which the panel is rated. When the over-current LED lights, the LX-Bus (es) and Keypad bus are shut down.

C. Control Unit
   1. The networked control panel shall provide the following capabilities:
      a) Expansion to a total of at least 10,000 user codes with 99 user profile definitions.
      b) Sixteen (99) independent door/keypad addresses, each with four zones.
      c) Twenty (20) Holiday Dates for custom holiday scheduling by area.
      d) A total door access granted event buffer of at least 10,000 events.
      e) Anti-passback access control selectable by area and user.
      f) Four (4) shift schedules per area.
      g) A total of at least 100 programmable output relay schedules.
      h) Thirty-two (32) individual reporting areas.
      i) Built-in bell and telephone line supervision.
      j) Require two-man access code or credentials.

k) Support programming to require the same or different access code entered within a programmed delay time of 1 to 15 minutes after disarming before activating a silent ambush alarm.
l) Support area programming that disables schedule and time-of-day changes while system is armed so that area can only be disarmed during scheduled times.

2. Control unit shall be capable of operating and supervising notification appliance devices as well as addressable initiating detection devices and an integrated supervised dual line digital communicator.
3. Control unit must be "Flash ROM" updatable, and program must be held in non-volatile RAM. The panel shall be able to function while the update is in process.
4. Control unit shall be capable of sending information to and receiving instructions from the existing District Wide Security Management Software via the District's Wide Area Network (WAN).
5. Control unit shall be capable of operating using an optional built in Encrypted Alarm Router for SCIF (Sensitive Compartmented Information Facility) applications that is certified by NIST (National Institute of Standards and Technology) for 128 Bit AES Rijndael Encryption communications.
6. The optional built-in Encrypted Alarm Router shall be capable of compliance with DCID 6/9 and UL 2050 standards.

D. Control Designations
1. Controls shall be provided to ensure ease of operation of all specified characteristics. Where applicable, clockwise rotation of controls shall result in an increasing function. Controls, switches, visual signals and indicating devices, input and output connectors, terminals and test points shall be clearly marked or labeled on the hardware to permit quick identification of intended use and location.

E. Test Modes
1. The system shall include a provision that permits testing from any alphanumeric keypad. The test shall include standby battery, alarm bell or siren, and communication to the District.
2. The system shall include a provision for an automatic, daily, weekly, thirty (30) day, or up to sixty (60) day telephone communication link test from the control panel installation site to the central station. The system shall also have the capability of testing the network communication path every four minutes.
3. The system shall include a provision for displaying the internal system power and wiring conditions. Internal monitors shall include the bell circuit, AC power, battery voltage level, charging voltage, panel box tamper, phone trouble line 1, phone trouble line 2, transmit trouble, and network trouble.

F. Serial Interface
1. The control panel shall be capable of a serial interface to output information to a standard serial printer or serial interface to a communication port on a standard computer. Through control panel programming the system shall include a provision to allow the selection of which reports are to be output.

G. Power Supplies
1. Power supplies for the control unit shall operate from 120 VAC, supplied at the respective protected areas. Standby batteries shall be supplied to power the system in the event of a utility power failure. Batteries shall be sized to provide 105% capacity for eight hours. Standby batteries shall be sealed lead-acid. Power supplies shall be all Solid State.
2. Controls shall be designed to maintain full battery charge when alternating current is available. Batteries shall be recharged to 85% capacity within 24 hours from battery use. The system shall be automatically transferred to battery power upon loss of alternating current power and return to alternating current power upon restoration. Intrusion alarms shall not be initiated during switch over; a signal shall be initiated upon failure of battery or alternating current power.

H. Software
1. The system shall have the capability to interface with computer software with the capability to fully program the panel by connecting to the panel through:
   a) Direct cable connection interface card
   b) Receiver phone line connection
   c) Standard phone line connection
   d) Ethernet network connection
   e) Network connection across the Internet or Wide Area Network (WAN).
2. The system shall interface with the existing District Wide Security Management Software via the District Wide Area Network (WAN).
3. The system shall interface with computer software capable of exporting reports in the following file formats:
   a) Excel spreadsheet (*.xls)
   b) Rich Text (*.rtf)
   c) Windows Metafile (*.wmf)
   d) QuickReport (*.qrp)
   e) Text (*.txt)
   f) Comma-separated (*.csv)
   g) HTML document (*.htm)
4. The system shall interface with computer software capable of printing custom, filtered reports including:
   a) All Events
   b) Zone Action
   c) Arming/Disarming
   d) Area Late to Close
   e) User Code Changes
   f) Door Access Granted
   g) Door Access Denied
   h) Opening/Closing Schedule Changes
   i) System Monitors
   j) System Events
   k) Event Acknowledgement

I. INTEGRATED INTRUSION DETECTION OPERATION
1. Access Authority Levels
   a) The system shall be capable of programming access credentials authority levels to check whether the user has access to a specific area and also has the authority to disarm or arm the area. If the user access credential has access and disarm/arm authority the system shall provide the user the option to disarm the area simultaneously upon opening the door, or to open the door and begin an entry delay timer. With the timer option the user then disarms the area using an intrusion control keypad inside the area. If the user only has access authority to the area and the area is in an armed condition, the user is denied access to the area.
2. Door Open Schedule Override
   a) The system shall be capable of programming certain area doors to be scheduled to unlock and lock at specific times of the day or night. The lock/unlock function shall be capable of an override option depending upon the area armed/disarmed status. If the area remains in an armed status at the scheduled unlock time the armed status overrides the unlock schedule ensuring the doors remain locked and armed in situations where the business might open late, close early, is affected by inclement weather, or another emergency.
3. Common Area
   a) The system shall be capable of programming a common area to be armed when the last area in the system is armed and disarmed when the first area in the system is disarmed. To ensure the common area works properly it

shall not have any user codes assigned to the common area. The system shall also be capable of programming multiple common areas.

4. Early Morning Ambush
   a) The system shall be capable of programming an area to require two user codes be entered within a programmed number of minutes to prevent an ambush message from being sent to the Central Station Receiver. If both user codes are not entered within the time an ambush message is sent to the central station receiver.
   b) Both user codes shall have the authority to disarm the specific area and must be entered at the same keypad or reader. The keypad shall not display any indication that the ambush timer is running.
   c) The system shall be capable of programming an output to provide an external indicator that an ambush situation is taking place.
5. Two-Man Rule
   a) The system shall be capable of programming an area to require two separate user codes be entered in order to disarm and/or allow access to a specific area. Both required codes shall have at least the same or greater authority level. Both required codes shall be entered within 30 seconds or an alarm shall activate.
6. UL Bank Safe & Vault Operation
   a) The system shall be capable of being programmed to only be disarmed during scheduled times regardless of the authority level of any user code or user profile in the system. The schedule and time and date set for this area shall not be capable of being changed while the area is armed. Zones assigned to Bank Safe & Vault areas shall not be able to be bypassed or force armed.
7. Panic Button Summary Test
   a) The system shall have the ability to test panic buttons without sending a panic alarm to the Central Station Receiver.
   b) The system shall also have the ability to send panic zone test verification and failure results to the Central Station Receiver.
   c) During the test, each time a panic zone trips, the display number shall increment and the keypad buzzer sound for two seconds.
   d) The number of panic zones tripped shall constantly display until the test ends or no panic zone activity has occurred for 20 minutes.
   e) When the Panic Zone Test ends and a zone failed (did not trip) during the test, the keypad shall be able to display the zone name and number and have the buzzer sounds for one second. Additional zone failed zones shall display when a button is pressed.

J. FALSE ALARM REDUCTION FEATURES
1. The system shall be capable of providing false alarm reduction features, functions, capabilities, or processes that either require alarms be verified or potential alarms be corrected before a system or zone can be placed into an armed state.
2. Exit Error Alert and Reporting
   a) The panel shall be able to provide an automatic function to prevent a false alarm from occurring if an exit door does not properly close after the system is armed.
3. Entry and Exit Delay Annunciation
   a) When arming, the system shall provide clear annunciation indicators to the user about the need to exit the premises prior to the exit delay time expiring.
   b) When disarming, the system shall notify the user the need to disarm the system prior to the entry delay time expiring.
4. Remote Annunciation

a) The system shall be able to provide entry and exit delay time period notification. This notification can be from DMP keypads, remote annunciators, or bell tests.

5. Abort Reporting
   a) The system shall be capable of sending an Abort report to the central station if the system is disarmed while the alarm is still sounding. The Abort report shall be sent *after* the alarm report to notify the central station that an authorized user has cancelled the alarm.
6. System Testing
   a) The system shall offer testing features that are simple, quick, and complete and provide the highest measure of safety by ensuring that alarm conditions are detected and communicated to the proper authorities in a timely manner and on a regularly scheduled basis.
7. Ambush Code
   a) The system shall offer ambush codes for those dangerous encounters where the user is instructed to either arm or disarm the system under threat of harm. The duress code shall disarm the system without giving local indication of an alarm that might put the user well-being in jeopardy.
8. Two-Button Panic Feature
   a) The system shall support DMP keypads that provide the option to use only two-button panic codes. The user shall be required to press and hold two designated keys for approximately two seconds before the system generates a panic alarm.
9. Fire Verify Zones
   a) The system shall support Fire Verify zones to help the panel verify the existence of an actual fire condition before it sends an alarm report to the central station. The Fire Verify zone shall require the panel to perform a Sensor Reset whenever a device connected to a Fire Verify zone initiates an alarm. This shall begin a verification period during which the panel waits for a second alarm initiation. If the original zone or any other Fire Verify zone on the panel initiates an alarm within the next 120 seconds, the panel shall recognize this as an actual alarm and send an alarm report to the central station.
10. Cross-Zoning Protection
    a) The system shall support cross-zoning as a means of requiring two device trips to occur within a short period of time before sounding an alarm and sending an alarm report to the central station. Supported device trips shall be from one device that trips two times, or from two devices that each trip once.
11. Swinger Zone Bypassing
    a) The system shall be capable of automatically bypassing a zone if it goes into an alarm or trouble condition a specified number of times within a one-hour period. The panel shall be able to track the number of times the zone trips while armed and compare that against a programmed number. When that number is reached, the panel shall be able to automatically bypass the zone. The panel shall be capable of resetting the zone when the area to which it is assigned disarms, is manually reset from the keypad or remotely, or remains normal for one hour.
12. Recently Armed Report
    a) The system shall be capable sending a System Recently Armed report, along with a zone alarm report, to the central station any time an alarm occurs within five minutes of the system arming. The System Recently Armed report allows the central station operator to follow a "call the subscriber first" procedure instead of immediately dispatching the police to what could be a false alarm.
13. Transmit Delay

a) The system shall be capable of programming the panel to wait up to 60 seconds before sending burglary alarm reports to the central station. If an alarm is accidental, the user shall be able to disarm the system within the programmed Transmit Delay time. An Abort report shall be sent in place of an alarm report after the system disarms. During the alarm, sirens and panel relay outputs shall not be delayed and shall still provide local condition annunciation.

14. Call Waiting Cancel
    a) The system shall be capable of being programmed to cancel call waiting any time the panel dials the receiver number to send a report.

2.02 SYSTEM CAPABILITIES

A. System Description

1. The system user shall be capable of selectively arming and disarming any one or more of 32 areas within the intrusion detection system based on the user PIN code and/or keypad used. Each of the 574 zones shall be able to be assigned to any of the 32 available areas. The system shall be capable of having up to a sixteen (16) character length name programmed for each area.
2. The system user shall be capable of assigning an opening and closing schedule to all areas or to each of the 32 areas separately. Each area shall be able to arm or disarm automatically by a schedule. The system shall have the capacity for common areas that automatically disarm when any other area disarms and that automatically arm when all others areas arm.
3. The networked system shall have the ability to comply with Bank Safe & Vault application. The networked system shall also have the ability to use a two-man rule for disarming or allowing door access to an area. The system shall have the ability to operate a Common Area application.
4. The system shall have a minimum of eight (8) grounded burglary zones available from the control panel.
5. The system areas and zones shall be programmable, and the system shall store, log, display, and transmit specific custom designations for system areas, zones, and user names.
6. To ensure continued, one-call support, the system shall be constructed of sensing components provided directly by the system manufacturer, such as power supplies, motion detectors, door and window position switches, glass break detectors, or other sensing devices that the manufacturer offers.
7. The system controller, user interfaces, zone input devices, relay output devices, and the system signal receiving equipment shall be engineered, manufactured, assembled, and must be distributed from a location within the United States of America.
8. The system shall support user interaction by way of a keypad, web browser, system software, key switch, or radio frequency wireless control, using integrated or auxiliary devices provided by the system manufacturer.
9. The system shall support controller zone input connections, system keypads, system zone expansion modules, and wireless zone input modules, and must support zone input connections by way of at least two competitive products. The system shall offer a seamless integrated compatibility with hard-wire and/ or wireless zone expansion equipment for at least 200 wireless zones and/ or a maximum of 574 hardwired zones.
10. The system shall be capable of offering at least five zone expansion buses, each of which can support the connection of up to 15,000 feet of four-wire cable. Zone expansion and keypad data buses that exceed 2,500 feet of cable must include splitter/repeater modules to boost data voltage and maintain data integrity.
11. The system shall provide a seamless capability to provide a minimum of 500 addressable relays, which can be located at any connection location upon a zone expansion bus.

12. System relay outputs shall have the capability of being triggered as a result of a command from the user interface, changes in system status, changes in zone status, or by a programmable schedule.
13. System relay output states shall be programmable for momentary, maintained, pulsed, or must follow the state of an associated system zone input.
14. The system shall be completely programmable either locally from a keypad or remotely through a standard dial-up, and network connections by way of a LAN, WAN, and/or by way of the Internet.
15. The control unit shall be completely programmable remotely using remote annunciators, and/ or using upload/ download software that communicates using SDLC 300 baud, 2400 baud, or IP Addressed data network. On-site programming from a personal computer shall also be permitted.
16. The control unit shall be equipped with an anti-reversing circuit breaker to prevent damage due to accidental reversal of battery leads.

B. Input/Output Capacity
   1. This system shall be capable of monitoring a maximum of 574 individual zones and controlling a maximum of 502 output relays.
   2. The control panel shall have, as an integral part of the assembly, 2 SPDT Form C relays rated at 1 Amp at 30 VDC and four open collector 12 VDC outputs rated at 50mA each. It shall also have the capacity of a maximum of 125 output expander modules with 500 switched ground, open collector outputs, 50mA maximum and 502 auxiliary relays (Form C rated at 1.0 Amp at 30 VDC).
   3. The panel shall also provide 100 programmable output schedules, and include an integral bell alarm circuit providing at least 1.5 Amps of steady, pulsed, or temporal bell output. Output type shall be programmable by zone type. Relays and voltage outputs shall be capable of being independently programmed to turn on and/or off at selected times each day.

C. User/Authorization Level Capacity
   1. The system shall be capable of operation by 10,000 unique Personal Identification Number (PIN) codes with each code having one (1) of ninety-nine (99) custom user profiles. This allows for limitation of certain functions to authorized users. The operation of all keypads shall be limited to authorized users.

D. Keypads
   1. The system shall support a maximum of sixteen (16) keypads with alphanumeric display. Each keypad shall be capable of arming and disarming any system area based on a pass code or Proximity key authorization. The keypad alphanumeric display shall provide complete prompt messages during all stages of operation and system programming and display all relevant operating and test data.
   2. Communication between the control panel and all keypads and zone expanders shall be multiplexed over a non-shielded multi-conductor cable, as recommended by the manufacturer. This cable shall also provide the power to all keypads, zone expanders, output expanders, and other power consuming detection devices.
   3. If at any time a keypad does not detect polling, the alphanumeric display shall indicate "SYSTEM TROUBLE". If at any time two devices are programmed for the same address, the alphanumeric keypad shall display “4 WIRE BUS TROUBLE”. If at any time a keypad detects polling but not for its particular address, the alphanumeric display shall indicate "NON POLLED ADDR". The system shall display all system troubles at selected keypads with distinct alphanumeric messages.
   4. The keypad shall include self-test diagnostics enabling the installer to test all keypad functions: display test, key test, zone test, LED test, relay test, tone test, and address test.

5. The keypad shall provide an easy-to-read English text display. The text shall exactly match the text seen in all software reports, keypad displays, and central station reports.
6. The keypad user interface shall be a simple-to-use, menu-driven help system that is completely user friendly.
7. The control panel shall support a keypad interface accessible on the World Wide Web in a browser window. The web-accessible keypad interface shall provide at least five (5) programmable hyperlinks for camera access or other use.
8. The system shall support sub-control keypads with four (4) built-in zones and capable of functioning in the following modes:
   a) Panel monitors all four (4) keypad zones independently with a maximum of 125 keypads attached to the control panel
   b) Panel assigns one (1) zone to each keypad and monitors all keypad zones as a single zone with a maximum of 500 keypads attached to the control panel
   c) Stand-alone mode allowing keypad to operate as a self-contained security system independent of the control panel

E. Zone Configuration
1. A minimum of 4 Class B ungrounded zones shall be available at each keypad or zone expander on the system. The system shall have the capacity for a maximum of sixteen (16) keypads and a maximum of 125 four (4) zone expanders or 500 single zone expanders. It shall also have the capacity of a maximum of 125 supervised relay output expanders.
2. Each zone shall function in any of the following configurations: Night, Day, Exit, Fire, Supervisory, Emergency, Panic, Auxiliary 1, Auxiliary 2, Fire Verification, Cross Zone, Priority, and Key Switch Arming.
3. The LX bus and the keypad bus shall be able to operate at a maximum wiring distance of 2500 feet from the control panel on unshielded, non-twisted cable. This distance may be extended to a total of 15,000 feet when bus splitter/repeater modules are installed.
4. The system shall have the capability to incorporate up to 500 addressable zone expander points.
5. Each zone shall function in any of the following configurations:
   a) Night
   b) Day
   c) Exit
   d) Fire
   e) Supervisory
   f) Emergency
   g) Panic
   h) Auxiliary 1
   i) Auxiliary 2
   j) Fire Verification
   k) Cross-Zone
   l) Priority
   m) Arming

F. Communication
1. The system shall be capable of signaling to two remote monitoring station receivers, four telephone numbers of 32 digits each using two separate switched telephone network lines such that if two unsuccessful attempts are made on the first line to the first number, the system shall make two attempts on first line to the second number. If these two attempts are unsuccessful, the system shall make two further attempts on the first line of the first number. After the tenth unsuccessful attempt, dialing shall stop and the alphanumeric keypad shall display trouble. Should another event occur that requires a report to be transmitted, the dialing process shall be repeated. The system shall have a

programmable option to dial a second set of telephone numbers after the first ten attempts using the same sequence.
2. The system shall be capable of communication using the IBM Synchronous Data Link Control format, and at least two other standard industry formats.
3. The system shall be capable of supporting Network communication with digital dialer backup, existing Ethernet or token ring data networks, satellite communication, fiber optic networks, local area networks, wide area networks, cellular communication, and retail data networks.

G. Network Communication
1. The control panel shall be capable of asynchronous network communication with a retry time between 3 and 15 seconds for a total of one (1) minute. If communication is unsuccessful the control panel shall be capable of attempting backup communication through any of the available communication methods to the same receiver or a backup receiver.
2. Network communication between the control panel and the receiver shall be in a proprietary communication format.
3. The control panel shall be capable of supporting Dynamic Host Communication Protocol (DHCP) Internet Protocol (IP) addressing.
4. Underwriters Laboratories (UL) shall list network communication by the control panel for Grade AA High-Line Security.
5. The control panel shall be capable of two-way network communication using standard Ethernet 10BaseT in a LAN, WAN, or Internet configuration.
6. The control panel shall be capable of communication by means of a 128 Bit AES Rijndael Encryption process certified by NIST (National Institute of Standards and Technology) to an SCS-1R receiver with a built-in Encryption Alarm Router.
7. The control panel shall be capable of meeting DCID 6/9 and UL 2050 standards.

H. TCP/IP Network Trapping
1. The control panel shall be capable of having communication set to Network operation. When a trap is set in Remote Link, the software shall be capable of sending a panel trap message with the panel account number to the iCOM or iCOM-E installed in an SCS-1R receiver.
2. The receiver iCOM or iCOM-E shall store the trap and monitor the panel for the next message. When the panel sends its next message, the receiver iCOM or iCOM-E shall then send a message to the panel to contact Remote Link at the IP address contained in the original trap message.
3. The trap message shall be stored in the receiver iCOM or iCOM-E for up to four hours. If the trap message is not sent to the panel within the four-hour window, the panel trap message shall be discarded and a new trap message must be sent from Remote Link.
4. The user shall be able to view the trap status in the receiver iCOM or iCOM-E in Remote Link using the Trap Query function.

I. NAC Circuit Configuration
1. The system shall be capable of additional Class B NAC circuits utilizing the Model 867 Notification Module. Each module shall be controlled and supervised via the SLC loop and monitor for short circuits, open circuits, and ground faults. The NAC circuits shall monitor for external NAC trouble conditions.
2. The system shall be capable of providing Class A NAC circuits utilizing the Model 865 Notification Module. Each module shall monitor for short circuits, open circuits, and ground faults. The NAC circuits shall monitor for external NAC trouble conditions and have a manual bell silence switch.

2.03 SYSTEM COMPONENTS

A. Control Panel
1. Intrusion Detection/Access Control Panel
a) **DMP - Model No. XR550NL-G**
1) Complete with large enclosure
2) Complete with Dialer

3) Complete with Network Interface Card
4) Quantity of (1) one required.

B. LCD Keypad
1. **DMP – Thinline Series Model No. 7060-W**
a) 32-character alphanumeric LCD display with blue backlit keyboard, self-diagnostic, three 2-button panics, supervised or unsupervised operation, alert sounder, armed and AC LED.
b) Keypad shall be complete with an integral proximity reader.
c) The intrusion detection system shall be designed to include a predetermined time delay between entry and alarm. Operation of the keypad shall abort the alarm condition and disable the system until re-armed.
d) During an alarm condition, the alphanumeric readout on the keypad shall indicate, by room name and number, the location of the alarm and the keyboard turns red.
e) Quantity as indicated on plans

C. Remote Power Supplies
1. **Altronix – Model No. SMP3 or SMP5**
a) Power supply for passive infrared detectors, 12VDC provide one in each building. Provide power supply, terminal cabinet, transformer and battery as required for a complete and operable system.
1) Terminal cabinet enclosure
(a) **DMP – Model No. 350-G or equal**
2) Transformer 120VAC-12VDC
(a) **DMP - Model No. 321**
3) Battery
(a) **Yuasa – Model No. NP7-12 or equal**

D. Data Bus Splitter/Repeater
1. **DMP – Model No. 710**
a) Expands the typical LX-Bus installation number of devices and the length of the wire.
b) Quantity as required.

E. Single Point Zone Expander
1. **DMP - Model No. 711 – Single Point Zone Expander**
a) The single point zone expander module provides a single addressable point and serves as the interface between the 4-wire LX Bus from the control panel and the conventional initiation devices (i.e. motion sensors and door switches).

F. Multi-Point Zone Expander
1. **DMP – Model No. 714 - four-point Zone Expander**
a) The four-point zone expander module provides four addressable points and serves as the interface between the 4-wire LX Bus from the control panel and the conventional initiation devices (i.e. motion sensors and door switches).
2. **DMP – Model No. 714-8 - Eight-point Zone Expander**
a) The eight-point zone expander module provides eight addressable points and serves as the interface between the 4-wire LX Bus from the control panel and the conventional initiation devices (i.e. motion sensors and door switches).
3. **DMP – Model No. 714-16 - Sixteen-point Zone Expander**
a) The sixteen-point zone expander module provides eight addressable points and serves as the interface between the 4-wire LX Bus from the control panel and the conventional initiation devices (i.e. motion sensors and door switches).

G. Motion Sensors – Triple Technology
1. **Bosch – Model No. DS950**

a) Surface wall mount motion sensor
b) 50’ coverage pattern
c) Locate motion sensors for optimum coverage per manufacturer’s recommendation.
d) Connect to LX Bus via zone expansion module

2. **Bosch – Model No. DS970**
a) Surface wall mount motion sensor
b) 70’ coverage pattern
c) Locate motion sensors for optimum coverage per manufacturer’s recommendation.
d) Connect to LX Bus via zone expansion module

3. **Bosch – Model No. DS9360**
a) Surface ceiling mount 360 degree motion sensor
b) Locate motion sensors for optimum coverage per manufacturer’s recommendation.
c) Connect to LX Bus via zone expansion module

H. Magnetic Door Contact
1. **Interlogix – Model No. 1078N**
a) Recessed mounted Steel Door Contact with wire leads, white
2. **Interlogix – Model No. 2505A-L**
a) Surface mounted Wide Gap Door Contact with armored cable leads

I. Siren
1. **ATW Security – Model No. DS-301SET**
a) 25 watt siren in indoor/outdoor stainless steel enclosure.
b) Sirens shall be provided only if indicated on plans.

J. Wire/Cable
1. Interior Device and LX/Keypad Bus Cable
a) **Falcon Wire - Model No. 590422R or equal**
1) 22/4-conductor solid CMR with white jacket
2. Underground LX Bus/Keypad Bus Cable
a) **Falcon Wire - Model No. 400418H20 or equal**
1) 18/4-conductor stranded FPL with black jacket
2) Water-blocked cable construction

PART 3- EXECUTION

3.01 DIVISION OF WORK

A. While all work included under this specification is the complete responsibility of the contractor, the division of actual work listed following shall occur.
1. All conduits with pull cords, all electrical pull boxes, grounding rods, all outlet boxes, terminal cabinets, backboards, etc., which form part of the rough-in work shall be provided and installed completely by the Division 16 Contractor. Coordinate as necessary for proper installation.
2. The balance of the system, including installation of initiating devices, notification appliances and equipment, making all connections, etc., shall be performed by the Factory Trained Technicians of the System Supplier/Installer.
3. All 120VAC power conductors and conduits associated with power circuits to all low voltage system equipment locations shall be provided and installed by the Division 16 Contractor.
4. System grounding, in compliance with CEC Article 250, by the Division 16 Contractor.
5. Labeling of pullboxes and terminal cabinets shall be provided and installed by the Division 16 Contractor.

3.02 INSTALLATION

A. All work shall be completed in strict accordance with all applicable codes and ordinances, by a qualified Manufacturer’s Authorized Distributor.
B. Cable/Wire

1. All cable/wire for the system specified herein shall be new, unless otherwise noted on plans.
2. System cable/wire and equipment installation shall be in accordance with good engineering practices as established by the California Electrical Code (CEC). Wiring shall meet all applicable electrical codes. All cable/wire shall test free from all grounds and shorts.
3. All cable/wire shall be labeled at all points of termination. All labeling shall be based on the room numbers as provided by the District or its representative.
4. Protection and dressing of cables:
   a) Cables mounted on backboards and within equipment racks, etc., shall be grouped and securely attached to the backboard or enclosure in horizontal and vertical bundles in a neat workmanlike manner using Thomas & Betts "Ty-Rap", Panduit cable mounts and Allen-Tel cable management or equal. Edge protection material ("cat-track") shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.
5. Shielding:
   a) **Shielded cable shall not be utilized for this system. No exceptions.**
6. Underground cables
   a) Any cable/wire pulled through manholes or pullboxes located below grade, shall be continuous with no splices. The cable/wire shall be intact with no cuts in the protective outer jacket. The cable/wire shall be suitable for this application.

3.03 SYSTEM START-UP

A. All start-up programming and system commissioning shall be performed by a manufacturer's trained and certified technician.

3.04 IN SERVICE TRAINING

A. The Contractor shall instruct personnel designated by the District in the proper use, basic care and maintenance of the system beyond the warranty period. Contractor shall provide up to four hours of in-service training with this system.

3.05 FACTORY TRAINING & CERTIFICATION

A. The manufacturer shall provide factory certified training to two (2) technicians from the District. These technicians shall be trained and certified as manufacturers certified technicians capable of performing any work on the system after the installation of the system.
B. All cost for training including travel, lodging, meals and per diem shall be included in the System Supplier/Installer's bid for this project.

3.06 CONTRACT CLOSE-OUT DOCUMENTATION

A. Contractor shall provide the following:
   1. One reproducible hard copy of project record drawings.
   2. One electronic (PDF)copy of manufacturer's maintenance and operation manuals.
   3. Three original, wet signed copies of system warranty

3.07 WARRANTY

A. The Contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will, within one year from the date of installation, repair or replace any equipment found to be defective. This warranty shall not apply to any equipment that has been subject to misuse, abuse, negligence or unauthorized modification.

END OF SECTION

SECTION 28 72 10
FIRE ALARM SYSTEM WITH VOICE EVACUATION AND MASS NOTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all material and labor required to expand existing fire alarm system to encompass new 3 story building. Provide new Edwards EST3 control panel and interconnect to existing campus fire alarm system via network. New panel shall be complete with in-building voice evacuation and i- building mass notification capabilities. Work performed under this section shall be coordinated with the risk analysis and emergency response plan previously developed for this campus facility.

B. This performance specification provides the minimum requirements for the Fire Life Safety System. The work provided shall include, but not be limited to, furnishing all equipment, materials, delivery, labor, documentation, testing, inspections by Inspector of Record (IOR) and services necessary to furnish and install a complete, operational Fire Alarm/Emergency Communication System.

C. At the time of bid, all exceptions taken to this specification, all variances from this specification and all substitutions of operating capabilities or equipment called for in this specification shall be listed in writing and forwarded to the District/Architect and Engineer. Any such exceptions, variances or substitutions that are not listed at the time of the bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.

D. The notification requirements for mass notification systems have the same requirements as fire alarm (per NFPA 72, Chapter 18). Speaker/strobes are most commonly used for in-building notification, with the same mounting and spacing requirements as fire alarm. NFPA 72 permits using the same notification appliances for fire alarm and mass notification purposes, but the appliance must have no marking or be marked “ALERT”. A “FIRE” marking is not permitted for notification appliances used for both purposes to help avoid confusion.

1.02 REFERENCES

A. All work and materials shall conform to all applicable Federal, State and local codes and regulations governing the installation.

B. The Fire Alarm System shall comply with the currently adopted versions of the following:

1. California Administrative Code (CAC), Title 24
    a. California Building Code (CBC) Part 2, Title 24, California Code of Regulations (International Building Code, with California Amendments)
    b. California Electrical Code (CEC) Part 3, Title 24, California Code of Regulations (National Electrical Code with California Amendments)
    c. California Mechanical Code (CFC) Part 4, Title 24, California Code of Regulations (Uniform Mechanical Code with California Amendments)
    d. California Fire Code (CFC) Part 9, Title 24, California Code of Regulations (International Fire Code with California Amendments)
2. National Fire Protection Association (NFPA) Standards
    a. NFPA 12 Carbon Dioxide Extinguishing Systems

b. NFPA 12A Halon 1301 Fire Extinguishing Systems
c. NFPA 13 Installation of Sprinkler Systems
d. NFPA 15 Water Spray Fixed Systems
e. NFPA 16 Foam-Water Sprinkler Systems
f. NFPA 17 Dry Chemical Extinguishing Systems
g. NFPA 17A Wet Chemical Extinguishing Systems
h. NFPA 72, National Fire Alarm and Signaling Code:
i. NFPA 90A, Installation of Air Conditioning and Ventilating Systems
j. NFPA 101, Life Safety Code - Safety to Life from Fire in Buildings and Structures
k. NFPA 750 Water Mist Fire Protection Systems
l. NFPA 2001 Clean Agent Fire Extinguishing Systems

3. ADA - Americans with Disabilities Act
4. Underwriters Laboratories, Inc. (UL) Standards

a. UL 38, Manual Signaling Boxes for Fire Alarm Systems
b. UL 268, Smoke Detectors for Fire Alarm Systems
c. UL 268A, Smoke Detectors for Duct Applications
d. UL 346, Waterflow Indicators for Fire Protective Signaling Systems
e. UL 464, Audible Signaling Devices for Fire Alarm & Signaling Systems
f. UL 521, Heat Detectors for Fire Protective Signaling Systems
g. UL 864, Control Units and Accessories for Fire Alarm Systems (9th Edition)
h. UL 1480, Speakers for Fire Alarm and Signaling Systems
i. UL 1481, Power Supplies for Fire Protective Signaling Systems
j. UL 1635, Digital Alarm Communicator System Units
k. UL 1638, Visible Signaling Devices for Fire Alarm & Signaling Systems
l. UL 1971, Signaling Devices for the Hearing Impaired
m. UL 2572 Mass Notification Systems
n. UOJZ, Control Units, System
o. SYZV, Control Units, Releasing Device
p. UOXX, Control Unit Accessories, System
q. SYSW, Accessories, Releasing Device Service
Note control equipment that is not dually UL 864 and UL 2572 listed is not acceptable.

C. National Electrical Manufacturers Association (NEMA)

D. Fire Protection Research Foundation

1. Intelligibility of Fire Alarm & Emergency Communication Systems, dated November 2008. This document shall be complied with as though it were a published and accepted standard.

1.03 SYSTEM DESCRIPTION

A. The project specification and drawings outline the requirements for a combination Mass Notification/Emergency Communication and Fire Alarm System (MNEC/FA) and include the following:

1. Existing Central Control Station (CCS) with FACP as indicated on the drawings. This CCS shall provide the command and control for existing and new buildings. The CCS shall also provide annunciation for all MNEC/FA events in accordance with UL 864, UL 2572 and project drawings
2. New combination Autonomous Control Unit/Fire Alarm Control Panel (ACU/FACP) control panel, power supplies, audio/visual indicating appliances, wiring, wire ways and related equipment shall be provided:

B. The system supplied under this specification shall be a microprocessor-based direct wired, multi-priority peer-to-peer networked system. The system shall utilize independently addressed, microprocessor-based smoke detectors, heat detectors, and modules/relays as described in this specification. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer

C. UL Listed intelligent analog addressable system, one-way voice communications with multiplexed signal transmission and survivable network nodes.

D. The System supplied under this specification shall utilize node-to-node, direct wired, multi priority peer-to-peer network operations. The system shall utilize independently addressed, input/output modules, audio amplifiers, and voice communications as described in this specification.

E. System shall be designed and tested for interior building audibility of 15 dBA-fast over ambient condition and intelligibility. Intelligibility shall be designed and tested to ensure Common Intelligibility Standard (CIS) rating of 0.7 or Sound Transmission Index of 0.5 in all areas designated on the drawings to have intelligible audio. All areas required to have intelligibility shall be modeled in a recognized computer modeling program such as EASE by Renkus-Hienz. All modeling output data shall be submitted to the Architect.

F. Any and all equipment/materials/installation/services and/or related items shall be included in this system, even if said items are not specifically called for in the project documents.

G. All peripherals new and existing EST-3 panels shall be connected to together to form a network and the fire control panels shall communicate on network communicate to main EST-3 panel at Administration building and slave panels at other buildings as indicated.

1.04 SUBMITTALS

A. Within thirty-five (35) calendar days after the date of the award of the contract, the Contractor shall submit to the Architect for review a complete Submittal Package. The Submittal Package shall consist of the following sections, with each section separated with index tabs.

1. Title Page

   a. Project Title
   b. Owner's name
   c. Architect's name
   d. Electrical Engineer's name
   e. Contractor's name

2. Index of Submittal Contents

   a. Each Section of the Submittal Package shall be numbered chronologically and shall be summarized in the Index.

3. Certifications

   a. Index of Certification Section Contents
   b. Valid State of California Contractors License
   c. Manufacturer's Certifications
   d. California DAS, Fire/Life Safety Technician Certifications
   e. National Institute for Certification in Technologies (NICET) Technician Level 3 or higher Certificate for the employee actively involved in this project.

4. Project List

a. A substantial list (minimum of 20) of completed projects equal in scope to that specified herein.

1) Contact information shall be made available upon request.

5. Product Data

a. Index of Equipment Data Sheets
b. Manufacturer's Data Sheets including cable types
c. Applicable Listings and Approvals

6. Shop Drawings

a. 1/8" scale shop drawings including all site plans, floor plans and wiring diagrams shall be submitted separate from the Product Data submittal.

1) **EXCEPTION –** K-12 school projects with DSA Approved plans and specifications shall not require shop drawing submittal due to the fact that contractor revisions to DSA Approved plans and specifications are prohibited by DSA. No changes to DSA Approved documents shall be made by the contractor regardless of shop drawing requirements included in other parts of the drawings or specifications.

B. Closeout Submittals.

1. Fire Alarm Contractor shall provide the following to District. Contractor shall be responsible to provide the required information in a timely manner subsequent to final IOR testing and completion of punch list work.
2. All drawing files shall be in AutoCAD Version 2000 format or later version as requested.
3. All drawings shall be orientated with north towards the top of the screen
4. Drawings shall have building backgrounds with room numbers, devices with address, and no conduit/wiring lines.
5. Drawings shall have a limit box around them leaving room for additional buildings to be added without changing the dimensions of the drawing.
6. Drawings shall include one site plan with only building outlines.
7. Device labels in SDU program shall begin with the school name.
8. Provide Gateway export files from SDU with First 80 selected and no other options selected.
9. Digital SDU files, system software and documentation shall be provided on 4GB USB flash memory drive (USB B) and stored at school site along with system documentation, IOR final sign off and as built drawings.

a. Provide Space age electronics, Inc. System Record Documents "SRD –ACE -11" Part # SSU00689 with EA0315 to store "Permanently labelled 'System Record Documents'" per NFPA 72 2013 7.7.2.4 at approved location at the school site. Provide minimum required documentation (SIG-FUN) per NFPA 72 2013- Section 7.2.1 including Test & Inspection records, service records, manuals and system records (NFPA 72 7.5.6.7

1.05 QUALITY ASSURANCE

A. All work specified in this Section shall be performed (furnished, installed and connected) by a qualified fire alarm contractor.

B. The contractor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.

C. Proof that the fire alarm contractor has successfully installed similar system fire detection,

evacuation voice and visual signaling control components on a previous project of comparable size and complexity.

D. Provide a statement summarizing any pending litigation involving an officer or principal of /or the company, the nature of the litigation and what effect the litigation may carry as it relates to this work in the worst case scenario. Non-disclosure of this item, if later discovered, may result, at the owner's discretion, in the contractor bearing all costs and any cost related to associated delays in the progress of the work.

E. Provide current liability insurance and state industrial insurance certificates in conformance with the contract document.

F. Service Capability: The fire alarm contractor shall have in-house engineering, installation and service personnel with a maintenance office within 50 miles of the project location.

G. Contractor who is not an authorized Edwards System Distributor for EST-3 panel and components may choose to buy equipment and devices from an authorized Edwards's system distributor (Smarts and Parts) and install per plans and specifications and Guaranty that the system installed and programmed will carry the same manufactures warranty. Programming of the system shall be performed by the Edwards authorized service personnel or Edward's authorized Distributor who is trained and certified for the equipment proposed on this project and install the software required to provide the specified functions.

H. Documentation that the fire alarm contractor has on staff personnel factory-trained and certified for the equipment proposed for this project.

1.06 WARRANTY

A. Provide 3 year unconditional warranty for entire system installed under this contract including labor and materials, system components, wiring, programming etc.

B. The Contractor shall guarantee all new equipment and new wiring free from defects in workmanship and inherent mechanical and electrical defects for a period of three (3) years from date of the final acceptance. During that period, the Contractor shall replace any defective materials or equipment provided under the contract without additional expense to the Owner.

C. Upon completion of the fire alarm system, the Contractor shall provide to the Owner's Designated Representative a signed written statement, substantially in form as follows:

1. "The undersigned, having been engaged as the Contractor on the Fire Alarm System installation on the Client Name, Client Facility, Client Address, Client City, Country project, confirms that the fire alarm system equipment was installed in accordance with the wiring diagrams, instructions, directions, and technical specifications provided to us by the Manufacturer and Owner's Designated Representative."

1.07 IN_SERVICE TRAINING

A. The Contractor shall instruct personnel designated by the District/Owner in the proper use, basic care and maintenance of the system beyond the warranty period. Contractor shall provide up to eight hours of in-service training with this system.

B. The instruction shall cover the schedule of maintenance required by NFPA 72 and any additional maintenance recommended by the system manufacturer.

C. Instruction shall be made available to the Local Municipal Fire Department if requested by the

Local Authority Having Jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling fire alarm system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

B. The Contractor shall provide, from manufacturer's current product lines, equipment and components, which comply, with the requirements of this specification. Equipment or components, which do not provide the performance and features, required by this specification are not acceptable, regardless of manufacturer.

C. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed and will accommodate the future requirements and operations of the building. All specified operational features must be met without exception.

D. All control panel assemblies and connected (new) field appliances shall be provided by the same System Supplier and shall be designed and tested to ensure that the system operates as specified. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

E. That equipment proposed to be supplied will be considered only if it meets all sections of the performance specification. No deviations of system performance outlined in this specification will be considered. It is the district standard to be compatible with EST-3 system:

F. Approved Products: All panels and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer’s name of each component. The catalog numbers specified under this section are those of EST by GE Security, Inc. and shall constitute the type, product quality, material and desired operating features.

2.02 SYSTEMS OPERATIONAL DESCRIPTION

A. Signal priority shall be in accordance with UL 2572 as indicated below:

1. Mass Notification
2. Life Safe/Fire Alarm
3. Other

B. Mass Notification/Emergency Communications (MNEC) operation shall be initiated only from the Existing Central Control Station (CCS) or respective building ACU/FACP or Local Operations Console (LOC). No automatic operation shall be permitted.

1. Any operation of MNEC at the building ACU/FACP or LOC shall be indicated at the CCS.
2. Any operation of the MNEC from the CCS shall indicate at the ACU/FACP & LOC (if provided) that the respective building system is in MNEC mode.
3. Provide all indicators required by UL 2572 and the Authority Having Jurisdiction (AHJ).
4. System operation shall be as specified in UL 2572.

5. Pre-recorded messages shall be selectable at the CCS and respective building ACU/FACP or LOC and shall consist of a minimum of the following:
    a. Lockdown
    b. Weather warning
    c. All Clear
    d. Evacuation
    e. Stand by
    f. Chemical emergency
    g. Test
6. The system shall be capable of live voice page from the CCS to each respective building. Live voice paging inside the respective building shall be capable of being initiated from the ACU/FACP or LOC

C. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Verified automatic alarm operation of smoke detectors.

D. Fire-alarm signal shall initiate the following actions:

1. Activate multiple channel pre-recorded voice messages followed by temporal tone.
2. Continuously operate the visual notification appliances.
3. Identify alarm at fire-alarm control unit and remote annunciators.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
6. Close smoke dampers in air ducts of designated air-conditioning duct systems.
7. Record events in the system memory.
8. Record events in the system printer.

E. 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 primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging circuitry
8. High or low battery charge.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

F. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.03 FIRE-ALARM CONTROL UNIT

A. The main control panel shall be a multi-processor based networked system designed

specifically for detection, and one-way emergency audio communications applications. The control panel shall be listed and approved for the application under the standard(s) as listed. The control panel shall be model GE-EST3 with components listed in the Fire alarm equipment's list on the drawings and fire alarm submittals.

B. The control panel shall include all required hardware, software and site-specific system programming to provide a complete and operational system. The control panel shall be designed such that interactions between any applications can be configured and modified using software provided by a single supplier. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

C. Network control panel shall be capable of:

1. Supporting up to 2500 intelligent analog/addressable points.
2. Supporting up to ten (10) intelligent addressable loops, each loop supporting 125 detectors and 125 modules, total of 250 points per loop.
3. Supporting network connections up to 63 other control panels and annunciators.
4. Supporting up to 124 (security/access control) Keypad/Displays.
5. Support up ten network digital dialers with Contact ID or SIA format and TAP Pager protocol.
6. Supporting multiple RS-232 communication ports and protocol.
7. Supporting up to 1000 chronological history events.
8. Total network response shall not exceed 3 seconds

D. 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, monitor, trouble and component status messages and control menu.

1. The common control switches and with corresponding LEDs provided as minimum will be; Reset, Alarm Silence, Panel Silence, and Drill. It shall be able possible to add additional switches/LEDs as required.
2. The main control panel shall have a display that is a 24 line by 40 character graphic LCD and backlit when active.
3. Each point shall have a custom event message of up to 40 characters, for a total of 80 characters. In addition, instructional text messages shall be supported with a maximum of 2,000 characters each.
4. Provide 8 simultaneous events to be displayed. The first seven (7) highest priority events in addition to the most recent event. The events shall be automatically placed in event types (Alarm, Supervisory, Monitor & Trouble) for easy access and it shall be possible to view the specific event type separately. Having to scroll through a mixed list of event types is not acceptable.
5. Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.
6. This display shall be an EST 3-LCDXL1.

E. Audio One-Way Voice Communications

1. The voice communication system shall be a four (4) channel audio evacuation system, to allow the ability to have eight simultaneous announcements/paging. The audio channels shall be designed as such:

   a. Mass Notification Message (HIGHEST PRIORITY)
   b. Fire Message
   c. Alert Message

d. Stand-by Message
e. Security/Weather Threat
f. Manual Paging
g. Other 2 messages determined by District.

2. The system custom digital voice message shall provide a minimum of 100 minutes and be created as a .wav file format. All messages shall be able to be created on-site without any special tools or burning of chips. Provide supervised audio amplifier as shown on drawings. The system software shall be capable of selecting the required audio source signal for amplification. To enhance system survivability, each audio amplifier shall automatically provide an internally generated local 3-3-3, 1000 Hz temporal pattern output upon loss of the audio signal from the one-way emergency audio control unit, during an alarm condition.
3. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall be a supervised, dedicated, selectable 24 Vrms or 70 Vrms output.
4. Provide a standby audio amplifier that will automatically sense the failure of any primary amplifier installed in the same panel and replace the function of the failed amplifier.

F. Provide an Emergency Voice Communication System with the following design features:

1. An audio control unit with Microphone for Paging.
2. Provide 3-position switch for each evacuation signaling zone and “All-Call”, with "Page FIRE", "Auto" and “Page ALERT” positions identified and two LED status indicators for each audio-visual evacuation signaling "zone", one red and one yellow.
3. These LED's shall illuminate to indicate respectively:

a. Evacuation signals activated (red),
b. Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

G. Provide 2-position switch for manually activate pre-recorded voice messages, with “Message Name" positions identified and one LED status indicators, one red. Provide minimum of 12 selector switches.

1. These LED's shall illuminate to indicate respectively:

a. Message activated (red)

H. 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

I. Circuit Requirements:

1. Signaling Line Circuits for Network Communications:

a. Class A

2. Dedicated Ethernet IP Network:

a. Class B.

3. Signaling Line Circuits for Intelligent Analog Addressable Loop:

a. Class B

1) No more than 100 detectors or 100 modules installed on a loop.

4. Initiating Device Circuit:

a. Class B

5. Notification Appliance Circuits:

a. Class B

1) Maximum circuit loading to 2 amps for visuals.

6. Activation of alarm notification appliances, smoke control, elevator recall and other functions shall occur within 3 seconds after the activation of an initiating device.

J. Smoke-Alarm Verification:

1. Initiate an audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -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.

K. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change to alternate 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.

L. Digital Alarm Communicator Transmitter: The system shall have an integrated off premise communications capability using a digital alarm communications transmitter (DACT) for sending system events to multiple central monitoring station (CMS) receivers. The system shall provide the CMS(s) with point identification of system events using 4/2, 3/1, Contact ID or SIA DCS protocols. The dialer shall have the capability to support up to 255 individual accounts and to send account information to eight (8) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being directed to one or more receivers depending on event type or location as specified by the system designed. In the event of a panel CPU failure during a fire alarm condition, the DACT degraded mode shall transmit a general fire alarm signal to the CMS.

M. Digital data transmission shall include the following (Contact ID)

1. Address of the alarm-initiating device.
2. Loss of ac supply or loss of power.
3. Low battery.
4. Abnormal test signal.
5. Communication bus failure
6. Shall be GE-EST, model 3-MODCOM.

N. Primary Power: 24V dc obtained from 120V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, shall be powered by nominal 24V dc source.

O. Secondary Power: Shall provide 24 hours supervisory and 15 minutes of alarm with batteries, automatic battery charger, and automatic transfer switch.

2.04 REMOTE ANNUNCIATOR

A. Annunciator shall match those of fire-alarm control unit LCD display functions for alarm, supervisory, monitor and trouble indications and common system controls including; acknowledging, silencing, resetting, and testing. See section 2.03 D for specific requirements.

1. This display shall be GE-EST, model 3-LCDANN

2.05 NAC POWER SUPPLY:

A. The NAC power supply shall be independent unit that will provide power to visual strobe notification appliances. It shall be possible to configure the NAC's to follow the main panel's NAC or activate from intelligent synchronized modules. The booster NAC's must be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. Fault conditions on the power supply shall not impede alarm activation of host NAC circuits or other power supplies. The NAC power supply must be able to provide concurrent power for notification devices, security devices, access control equipment and auxiliary devices such as door holders. All the NAC Power Supplies shall be synchronized. The power supply shall support up to 24amp/hour batteries.

1. Power supply shall be minimum of 10 amps and UL 864 Listed.
2. Four independent 3 amp NAC circuits. Each being configurable as auxiliary power.
3. All circuits shall be synchronized.
4. Do not use FACP to provide NAC circuits for notification devices, provide separate Power supplies as indicated on the drawings.
5. Shall be GE-EST, model BPS10A

2.06 INTELLIGENT ANALOG SYSTEM SMOKE DETECTORS

A. General Requirements for Intelligent Analog Detectors

1. Integral Microprocessor: All decisions are made at the detector determining if the device is in the alarm or trouble condition.
2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, last maintenance date, number of alarms and troubles, time of last alarm and analog signal patterns for each sensing element just before last alarm.
3. Electronic Addressing: Permanently stores programmable system address. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable.
4. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location and the device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
5. Sensitivity Range: Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive, normal, less sensitive or least sensitive. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. It shall be possible to program control panel activity to each level.
6. Pre-Alarm: Detector stores 20 pre-alarm sensitivity values to alert local personnel prior to the sensor reaching a full evacuation sensitivity. Sensitivity values can be set in 5% increments.
7. Environmental Compensation: The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as

dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal when the detector reaches 75% (Dirty) to 99% (More Dirty) compensation has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.

8. Twin Status LEDs: Flashing Green LED shows normal; flashing RED shows alarm state; steady RED and steady GREEN show alarm state in stand-alone mode, visible from any direction.
9. UL Sensitivity Testing: The detector shall utilize a supervised microprocessor that is capable of monitoring the sensitivity of the detector. If the detector sensitivity shifts outside of the UL limits, a trouble signal is sent to the panel.
10. Device Replacement: The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or a change in the application program profile has been made.

B. Intelligent Photoelectric Detector

1. Provide intelligent analog addressable photoelectric smoke detectors at the locations shown on the drawings.
2. Provide GE-EST, model SIGA2-PS

C. Detector Base Types

1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4” octagon box and 4” square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.

a. Provide GE-EST, model SIGA-SB4

2.07 INTELLIGENT 135 DEGREE FIXED TEMPERATURE / RATE OF RISE HEAT DETECTOR

A. Provide intelligent combination fixed temperature/rate-of-rise heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135^{o}F (57^{o}C) and a rate-of-rise alarm point of 15^{o}F (9^{o}C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount application

B. Intelligent Heat Detector

1. Provide GE-EST, model SIGA2-HRS

C. Detector Base Types

1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4” octagon box and 4” square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.

a. Provide GE-EST, model SIGA-SB4

2.08 FIXED TEMPERATURE LOW PROFILE ATTIC HEAT DETECTORS

A. Provide fixed temperature low profile attic heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The heat detector shall have a nominal fixed temperature alarm point rating of 194°F (88°C). The heat detector shall be rated for a maximum smooth ceiling rating of 2,500 sq. ft. (232 m2).

1. Provide GE-EST, model 284B-PL
2. Accessory mounting plate model 280A-PL, included.
3. Detectors shall be individually monitored by addressable SIGA-CT1 monitor module.

2.09 INTELLIGENT MODULES

A. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller.

1. Integral Microprocessor: All decisions are made at the module determining if the device is alarm or trouble condition.
2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, number of alarms and troubles, time of last alarm.
3. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location. The device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
4. Twin Status LEDs: The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
5. Input and output circuit wiring shall be supervised for opens and ground faults.
6. Two styles of modules shall be available, those designed for gang box mounting, and where multiple modules are required in a single location, plug in modules shall be provided with a Universal Input/Output motherboard.

B. Intelligent Input Module. The Input Module shall provide one or two supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:

- Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
- Normally-Open Alarm Delayed Latching (Waterflow Switches)
- Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
- Normally-Open Active Latching (Supervisory, Tamper Switches)

1. Provide GE-EST model SIGA-CT1 or CT2 or SIGA-MCT2

C. Intelligent Relay Module. Provide addressable control relay circuit modules shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

1. Provide GE-EST, model SIGA-CR or SIGA-MCR.

D. NAC Control Module: Provide intelligent NAC control module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. The gang box -mounted version shall be suitable for mounting in North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The plug-In version shall plug into a universal multi-module motherboard. The NAC control module shall support the following operations:

- 24volt NAC circuit
- Audio notification circuit 25v or 70v
- Telephone Power Selector with Ring Tone (Firefighter's Telephone)
- Visual Synchronized Output to Genesis appliances or to NAC Power Supply.

1. Provide GE- EST; model SIGA-CC1 or –CC1S.

2.10 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. The manual pull station will have an intelligent module integral of the unit.
3. Station Reset: key operated switch shall match the control panel key.
4. Manual pull stations that initiated an alarm condition by opening the unit are not acceptable.
5. Provide GE-EST, model SIGA-278.

B. Indoor Protective Shield: Factory-fabricated clear plastic enclosure. Hinged at the top to permit lifting for access to initiate alarm. Lifting the cover actuates an integral battery powered audible horn (when noted on the drawings) intended to discourage false-alarm operation.

2.11 ISOLATION CONTROL RELAY

A. HVAC Pilot multi-volt relay: 10 amp pilot relays with 120VAC coil

1. Provide Functional Devices Inc. model RIBU1C
2. CSFM listed 7300-1555-0100

2.12 NOTIFICATION APPLIANCES

A. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions.

B. Notification Appliances – Visual (Fire – Evacuation)

1. Provide wall or ceiling mounted clear lens strobes with white body. Strobes shall provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110

cd flash output rating, UL1971 listed with in-out screw terminals shall be provided for wiring. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting. All strobes shall be capable of synchronization to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules. The strobes shall mount to one-gang electrical box.

2. The device shall have plastic protective cover for during installation.
3. The actual candela setting on the visual shall be marked on the appliance.
4. Provide GE-EST, model Genesis Series devices. G1R – VM (wall), GC – VM (Ceiling)

C. Notification Appliance - 4" Cone Speaker

1. Speakers shall have a 4" Mylar cone, paper cones are unacceptable as equal. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 70V systems. The actual speaker wattage & strobe candela setting shall be viewable from the device window to verify the wattage setting, without removing the device. To make any changes to the speaker wattage will only require the removal of the cover plate.
2. At the 2-watt setting, the speaker shall provide a 90 dBA sound output over a frequency range of 400-4000 Hz. as measured in reverberation room per UL-1480.
3. Combination speaker strobes shall meet both sections of above.
4. The device shall have plastic protective cover for use during installation.
5. The actual wattage setting on the speaker shall be marked on the face of the appliance.
6. Provide GE-EST, model Genesis Series devices. G4R – S7VM (wall), GC-S7VM (Ceiling)

D. Notification Appliance - Re-entrant Speakers

1. Provide 4” white re-entrant speakers at loud ambient locations or for outdoor weatherproof installation. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w, 4w, 8w, and 15w power taps. The re-entrant speakers shall utilize a high-efficiency compression driver. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.
2. Combination speaker strobes shall meet both sections of above.
3. Provide GE-EST, model WG4RN-S.

2.13 NOTIFICATION APPLIANCES

A. Inspection bar codes shall be installed on all initiating devices, annunciators, control panels and power supplies.

B. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of serial numbers. Serial number shall be printed below the bar code for identification purposes.

C. Inspection bar codes shall be limited in size to no more than 2” (5cm) in width, and 3/8” (2 cm), in height and shall include a Mylar® or other protective coating to protect the bar code from fading due to sunlight or exposure.

D. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12” from the device during inspection.

E. Provide Identification labels at each device matching the device ID number shown on the riser diagrams.

2.14 WIRE AND CABLE

A. Signaling Line Circuits – Network Data: Twisted pair, not less than No. 18 AWG or as recommended by the manufacturer.

B. Signaling Line Circuits – Intelligent Loop: Non-Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer.

1. Circuit Integrity Cable: Provide as required to meet NFPA or Local Code requirements.
2. CI Cable shall meet article 760, power limited fire alarm service.

C. Notification Appliance Circuits –

1. Audio: Twisted pair, not less than No. 16 AWG or as recommended by the manufacturer.
2. Visual. Non-Twisted pair, not less than No. 14 AWG or as recommended by the manufacturer.

D. 120 VAC circuits

1. Minimum 10 AWG for panel power circuits. Minimum 12 AWG for all other circuits.
2. Sharing of neutrals is prohibited. Each circuit shall have its own dedicated neutral conductor.

2.15 Spare Parts: provide 10% of the total number of devices but not less than 2 as spare parts for all Initiating devices (manual pull stations, smoke detectors, heat detectors, notification appliances strobes, strobe speakers).

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 and CEC Article 760.

B. Any low-voltage copper wiring that leaves the protection of a building shall be provided with a system manufacturer specified UL 497B listed transient protection devices where the circuit leaves the building and where it enters the next building.

C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A in NFPA 72.
4. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
5. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Provide HAVC shut down using full area coverage smoke detection system as specified on the drawings.

E. Wall-Mounted Notification Appliances: Install so entire appliance is between 80 and 96 inches above finished floor on the wall.

F. MNEC/FA Control Units: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

G. LOC/Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.02 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 Division 8 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Smoke dampers in air ducts of designated air-conditioning duct systems.
3. Alarm-initiating connection to activate emergency lighting control.

3.03 WIRING

A. The Contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets, and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the Manufacturer, approved by the CFC/CEC, and shall be installed in conduit throughout.

B. As a minimum, the entire wiring system for the new and/or modified existing fire detection and alarm system shall be in full accordance with the applicable version of the California Electrical Code.

C. The system control unit shall be arranged to receive power from a dedicated three-wire, 15/20 amp, 120 VAC supply and shall be obtained from the Building Power panel.

D. The fire alarm control panel shall have a marking on the inside, which shall indicate the electric panel board and circuit breakers, protecting the feeders to the control panel.

E. All low voltage operations for all fire alarm system devices shall be provided from the control unit.

F. All new wiring for the initiating devices, notification appliances, shall be single, solid copper conductor, rated 600 V with cross-linked polyethylene or FTFE fluoropolymer insulation and shall comply with the appropriate sections of the California Electrical Code/CEC/CFC. The insulation shall be UL Listed as flame retardant and moisture proof. All underground cables shall be “Aqua Seal” rated, no splices are permitted anywhere, all connections shall be made at device back box/terminal cabinets.

G. All system wiring size shall be as determined suitable by the Manufacturer and in compliance with the current carrying capacities as set forth by the California Electrical Code, yet they shall not be any smaller than as specified herein. The following minimum sizes of conductors shall be used for all new wiring:

a. Power Supply Conductors: No. 12 AWG.
b. Automatic Detector and Manual Pull Station Conductors: No. 16 AWG.
c. Remote Annunciators: No. 16 AWG.

d. Notification Appliance Units: No. 12 AWG.

H. Each circuit shall utilize wire of a color different and distinguishable from other circuits. Color coding shall be approved by the Owner's Designated Representative. Colors shall be continuous throughout each entire circuit.

I. Raceways containing conductors identified as "Fire Protective Alarm System" conductors shall not contain any other conductors, and no AC carrying conductors will be allowed in the same raceway with the DC fire alarm detection and signaling conductors.

J. End-of-line resistors shall be furnished as required and shall be mounted as directed by the Manufacturer. End-of-line resistors shall comply with the system Manufacturer's recommendations. The field location of the End-of-line resistors shall be labeled so that the devices may be easily located, and that location shall be noted on the point-to-point drawings.

K. All wiring within the control panel shall be neatly served in the panel gutters, where applicable, and shall be secured by means of Thomas & Betts "Ty- Raps" or by other approved means.

L. All wiring shall be tested for stray voltage, short circuits, and ground faults prior to connection to the control panel and any devices.

3.04 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Electrical Identification."

B. Install framed instructions in a location visible from fire-alarm control unit.

C. All initiating devices (smoke, heat, manual pull stations, modules, relays etc.,) shall have bar code label installed visibly on the device. This bar code shall be used for digital inspection of the fire alarm system using Building Reports.Com. Provide identification labels at each device with device numbering per riser diagram.

3.05 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.

3.06 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect, Engineer and authorities having jurisdiction.

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 and certified service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Fire Alarm Contractor shall perform pre-test prior to scheduling IOR testing/inspection of tests.
2. The Owner/Construction Manager shall be notified in writing, 48 hours in advance to

schedule IOR for formal testing of the entire Fire Alarm system as required by the contract documents and NFPA 72 reports.

3. 48 hours prior to IOR inspected fire alarm system testing, the Fire Alarm Contractor shall turn over the program SDU Files and Associated CAD Files to the District as well as the program points list of entire site. The IOR/District will employ a 3rd Party EST3 certified Programmer to review the files for accuracy.
4. Should more than 3 programming errors occur during the test; the test will be concluded and labeled as a failure. Rescheduling of the test will be required through the inspection request process identified within the specifications. All fees and costs associated with retesting of the system will be at the Contractor's expense. This includes but not limited to IOR fees, 3rd party EST Programmer fees, Construction Mangers Fees, etc...
5. Should three errors or less occur that can be corrected immediately within the program at the site, the IOR testing will continue. On completion of the test, if the site passes, the Fire Alarm Contractor will turn over to the District prior to leaving the site, the updated and corrected SDU program files.
6. If the CAD files need to be corrected, the Fire Alarm Contractor will have 48 hours from the time the fire alarm testing is completed to turn the updated CAD Files.
7. The Fire Alarm Contractor will shall provide a new updated and current Points List for every time the fire alarm is tested.
8. On Completion of the Fire alarm System Test upon passing, the Fire alarm Contractor will have on hand and provide (3) Hard copies of the Fire Alarm and Emergency Communication System Record of Completion and the Fire Alarm and Emergency Communication System Inspection and Testing Form (NFPA 72 Forms completed and signed by Contractor, IOR and the District.

E. Provide identification sign per detail mounting of fire alarm sign inside.

F. Provide laminated school MAP (11 x17”) identifying location all manual pull stations, Control panel, annunciator, power supplies at administration office

G. Warranty work or repairs made that require programming of device the contractor must update the SDU program files. Contractor is to adhere to the Fire Alarm Testing Procedure as stated above

H. Contractor shall provide network cable from slave panel to main Fire alarm panel. Contractor shall identify the port and provide port information and mac address of network communication device to the Owner/CM. Contractor shall make all network terminations and connections and verify the network is communicating with the fire alarm panel. Coordination with District IT and the Constriction manager for programming DACT for remote monitoring station.

I. Prior to final acceptance, the Contractor shall deliver to the Owner complete, simple, comprehensive, step-by-step testing instructions providing recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete troubleshooting manual explaining what might be wrong if a certain malfunction occurs and explaining how to test the primary internal parts of each piece of equipment.

J. Prior to final acceptance, the Contractor shall provide four (4) complete sets of maintenance instruction manuals to the Owner.

K. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

1. Instructions on replacing any components of the system, including internal parts, Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions. A complete list of all equipment and components with information as to the address and phone number of both the Manufacturer and local supplier of each item.

L. All aspects of the system operation and maintenance shall be detailed, including a written description of the specific system design (a typical description will not be accepted), system logic diagrams, electrical wiring diagrams of all circuits, drawings illustrating equipment locations, and technical data sheets describing each piece of equipment used in the system.

M. Visual Inspection:

1. Conduct visual inspection prior to testing.
    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "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 "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 for Speech Intelligibility for areas indicated on the drawings in accordance with Fire Protection Research Foundation's "Intelligibility of Fire Alarm & Emergency Communication Systems" dated November 2008.
5. Test audible appliances for the private operating mode according to manufacturer's written instructions.
6. Test visible appliances for the public operating mode according to manufacturer's written instructions.
7. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

N. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

O. Fire-alarm system will be considered defective if it does not pass tests and inspections.

P. Prepare test and inspection reports.

Q. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

R. Annual Test and Inspection: During the warranty period, each year test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

S. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Architect. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicate a devices trouble. A copy of UL letter is to be provided as proof of system operation

3.07 DEMONSTRATION

A. The Contractor shall be responsible for coordinating and conducting the demonstration test.

B. Upon completion of the installation of the fire alarm system, the Contractor shall provide a minimum of one week's notice to the Owner and the Owner's Designated Representative that the fire alarm system has been satisfactorily tested by the Contractor, and the Manufacturer's representative and is ready for the demonstration test.

C. At the time of notification, the Contractor shall submit "As-Built" drawings and a "Test Plan" which shall describe how the system will be tested.

D. The test plan shall include a step-by-step description of all tests to be performed and shall indicate type and location of test apparatus to be employed. The tests shall demonstrate that the operating and installation requirements of this specification have been met.

E. The demonstration test shall not be conducted until the "Test Plan" is approved.

F. All tests shall be conducted in the presence of the Owner and the Owner's Designated Representative.

G. The Contractor shall provide all the necessary personnel and equipment required to conduct the test.

H. The demonstration test shall be conducted between the hours as requested by the district.

I. At the demonstration test, the Manufacturer's technical representative shall deliver to the Owner's Designated Representative an Inspection and Test Report, which shall be completed in conjunction with the demonstration test and shall indicate the following:

1. Project information, including name, address, and city.

2. The Contractor's name, address, city, and telephone number.

3. The control panel configuration, serial number, extent of battery backup, locations of remote annunciators, a description of remote functions, and type of fire department connection.

4. The total quantity of alarm signal units, pull stations, and each type of detector.

5. The quantity of alarm signal units, pull stations, and each type of detector in each zone. In addition, the connection position of each device shall be indicated, and, further, indicate the test result of each device and any subsequent action taken.

6. Pertinent comments regarding the installation, operation, testing, inspecting, or other aspects of the system.

7. The Manufacturer's technical representative shall print his/her name and affiliation and sign and date the document.

J. The tests shall demonstrate that the entire control system functions as intended. All circuits and devices shall be tested, including equipment shutdown, alarm signaling devices, and auxiliary functions. In addition, supervision of each circuit shall be tested.

K. As a minimum, the Contractor shall perform the following:

1. Operate every fire alarm device to ensure proper operation, correct annunciation at each remote annunciator and at the control panel, and proper operation of auxiliary functions.

Where applying heat would damage any detector, they may be manually operated.

2. The initiating circuits and the notification circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry.

3. One-half of all tests shall be performed on battery standby power.

4. Upon satisfactory completion of the demonstration test, the Contractor shall leave the system operating for a minimum of one week prior to the fire department's Acceptance Test.

5. If unsatisfactory results occur during or after the demonstration test, the Contractor shall be responsible for any and all additional charges incurred by the Owner with respect to corrective action including, but not limited to, test monitoring and engineering services during the time it takes to obtain final acceptance by the Owner.

End of Section

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:
   1. Clearing.
   2. Removing above- and below-grade site improvements.
   3. Disconnecting, capping, or sealing site utilities.
   4. Temporary erosion- and sedimentation-control measures.

1.02 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.03 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 Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated by Owner’s direction.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation- control is in place.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Not applicable

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 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.

3.03 EXISTING UTILITIES

A. 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.

B. Interrupting 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 Owner and Engineer not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Engineer's written permission.

3.04 CLEARING AND GRUBBING

A. Fill depressions caused by clearing 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 and compact each layer to a density equal to adjacent original ground.

3.05 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Existing signs and sign poles to be salvaged shall be removed and stored on the project site in a secure area.

3.06 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 Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable 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

SECTION 31 22 00
GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.

C. Related Sections:
   1. Section 31 23 00 – Excavation, Backfilling, and Compaction.
   2. Section 32 11 23 – Base Course.

1.02 SYSTEM DESCRIPTION

A. General:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
   4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on buried utilities and pipelines.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.

B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.02 ROUGH AND FINE GRADING

A. Rough grade area sufficiently high to require cutting by fine grading:
   1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.
   2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.
   3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.
   4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten, and roll to obtain required density and indicated finish grades.
   5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.

B. Base or Subgrade:
   1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 6 inches:
      a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.
      b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be 95 percent minimum for the top 6

inches below subgrade.

c. Install base course in accordance with Section 02319: Base Course.

2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.03 SHORING

A. Provide shoring as necessary to support earth sides of excavations properly and safely, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of governing California Building Code and Safety Orders of State of California, Division of Industrial Safety; Title 8, Subchapter 4, Article 6, Sections 1530 and 1541.

C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCESS MATERIAL DISPOSAL

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 31 23 16

EXCAVATION, BACKFILLING AND COMPACTING FOR PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Excavating, backfill, and compacting for paved areas.
   2. Installation of fill materials.

1.02 SYSTEM DESCRIPTION

A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 SUBMITTALS

A. Imported Soils: A geotechnical engineer, retained by the Owner as a Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of sub-section 3.05 of this section.

1.04 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 32 24 00.

1.05 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the foundation investigation and soils report is available for examination at the Architect's office during regular office hours of Architect.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

A. Concrete Slabs On Grade: Provide "Crushed Aggregate Base " as specified in the Standard Specifications for Public Works Construction, Section 200: "Rock Materials," with ¾ inch maximum size aggregates. Provide 3 inch thick base, unless noted otherwise.

B. Bituminous Surfacing: As indicated on Drawings and specified in Section 32 11 23 - Base Course.

2.02 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be previously excavated materials or imported fill material, free of clods and stones larger than 3 inches, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and/or moisture content shall be blended and/or aerated to stabilize and upgrade the material.

C. Imported Fill Material:
   1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.

2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not more than 6 percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Other Fill Materials: Brick rubble and broken concrete originating from the Project site may be legally disposed of off the Project site or incorporated in fill, if reviewed by a geotechnical engineer, retained by the Owner as an Owner Consultant. Unless otherwise required, no such materials may be imported from outside the Project site.

E. Permeable Backfill:

1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size:	Percentage Passing:
3/4 inch (19mm)	100
3/8 inch (10mm)	80-100
No. 100	0-8
No. 200	0-3

Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

1. Provided backing for weep-holes shall consist of 2 cu. ft. of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.
2. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system such as Miradrain by Mirafi, Inc., or equal, may be provided if reviewed by the Architect.

PART 3 - EXECUTION

3.01 SITE PREPARATION

A. Clear the Project site as required in Section 31 10 00: Site Clearing.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

3.03 EXISTING UTILITY LINES

A. Protect existing utility lines from damage or displacement.

B. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of 2 feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

3.04 EXCAVATION

A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

3.05 FILL

A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

B. Provide fill materials as specified in Part 2 – Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

C. In addition to the requirements of this section, import and/or exported materials shall comply with the requirements of Section 32 24 00.

D. Imported fill materials shall be sampled by a geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.

E. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit all samples to a DSA approved independent approved testing laboratory for testing.

F. Initial sampling shall be performed by the geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial and additional samples from the identified site and shall submit all samples to the approved independent testing laboratory for testing.

G. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1000 cubic yards of material, one sample shall be obtained and submitted for testing tested for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

H. The independent approved testing laboratory shall perform the required tests and report results of all tests noting if the tested material passed or failed such tests and shall furnish copies to the PI, Architect, OAR, DSA, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, Title 24, CCR and the DSA. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report to the DSA as required by Title 24, CCR.

I. Bills of lading or equivalent documentation will be submitted to the IOR on a daily basis.

J. Upon completion of import operations, provide the OAR a certification statement attesting that all imported material has been obtained from the identified source site.

3.06 INSTALLATION OF MATERIALS

A. A. Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but no more than 1 in 20. Provide adequate drainage at all times during construction of the Work of this section.

3.07 COMPACTING

A. A. Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but no more than 1 in 20. Provide adequate drainage at all times during construction of the Work of this section.

3.08 INSPECTION AND TESTING

A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The geotechnical engineer, retained by the Owner as an Owner Consultant, will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill shall be observed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

D. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D 1557, Method C.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.10 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 31 23 17
EXCAVATION, BACKFILLING AND COMPACTING FOR STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Excavating, backfilling, and compacting for buildings and structures.
   2. Fill materials.

1.02 SYSTEM DESCRIPTION

A. Import and Export of Earth Materials:
   1. Fees: Pay as required by authorities having jurisdiction over the area.
   2. Bonds: Post as required by authorities having jurisdiction over the area.
   3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.

1.03 SUBMITTALS

A. Imported Soils: A geotechnical engineer, retained by the Owner as a Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of sub-section 3.05 of this section.

B. Shoring calculations as required in sub-section 3.03 of this section.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition, except as modified herein.

B. Sampling, testing, and certification of imported and/or exported soils shall be performed in accordance with Section 01 40 00.

1.05 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A geotechnical Evaluation report, by Ninyo & Moore Geotechnical & Environmental Sciences Consultants (Project No. 211897001), dated September 30, 2022, was prepared for this project. Prior to bidding or performing the work of this project, the contractor shall thoroughly familiarize himself/herself with the contents of the report.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIALS

A. Fill and backfill materials shall be a granular material previously removed from excavation, or imported fill material, free of large clods and stones larger than 3 inches, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.

B. Fill material exhibiting a wide variation in consistency and or moisture content shall be blended and/or aerated to stabilize and upgrade the material.

C. Imported Fill Material:
   1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.
   2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not more than 6 percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

D. Other Fill Materials: Brick rubble and broken concrete originating from the Project site may be legally disposed of off the Project site, or incorporated in fill, if reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant. Unless otherwise provided, no such materials may be imported from outside the Project site.

E. Permeable Backfill:
   1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

SIEVE SIZE	PERCENTAGE PASSING
3/4 INCH	100
3/8 INCH	80-100
NO. 100	0-8
NO. 200	0-3

F. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.

G. Provided backing for weep-holes shall consist of 2 cu. ft. of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.

H. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system such as Miradrain by Mirafi, Inc., or equal, may be provided if reviewed by the Architect.

PART 3 - EXECUTION

3.01 SITE PREPARATION

A. Clear the Project site as required in Section 31 10 00: Site Clearing.

3.02 PROTECTION

A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, OSHA regulations.

B. Protect adjacent existing improvements including landscaping against damage.

C. Shore, crib, or lag excavations and earthen banks as necessary to prevent caving- in, erosion or gullying of sides.

D. Divert or de-water excavations until concrete is placed, forms are removed, and backfilling is complete.

3.03 SHORING

A. Provide shoring as necessary to properly and safely support earth sides of excavations, curbs, sidewalks, gutter, drives and stairs, against movement and collapse.

B. Design and Calculations: Provide in accordance with requirement of governing California Building Code and Safety Orders of State of California, Division of Industrial Safety, Title 8, Subchapter 4, Article 6, Sections 1530 and 1541.

C. Remove shoring upon completion of Work, or when no longer needed, unless otherwise required by authorities having jurisdiction over the Work.

3.04 EXCAVATION

A. Form sides of footings, pads, grade beams, and slab foundations, unless otherwise indicated. Provide excavations of sufficient size to permit installation and removal of forms and other Work as required.

B. Machine-drill excavation for round footings to size and depth indicated. Provide a collar or casing, or other adequate protection, to exclude dirt and debris. Protect excavations with plank covers until concrete is placed.

C. Provide excavation bottoms level and free from loose material. Excavate to indicated or required elevations of undisturbed earth.

D. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.

E. Calculate excavation quantities based on elevations or depths indicated on Civil Drawings and the “SCHEMATIC DIAGRAM OF FOUNDATION PREPARTAION” shown on sheet S0-01.

F. Provide 2000 psi concrete for backfill of over-excavated areas to indicated or required elevations.

G. Special preparation of B.E.P. areas: Excavate areas designated on Drawings as bottom of excavated planes (B.E.P.), by excavating and filling to indicated grades and elevations.

3.05 IMPORT/EXPORT OF MATERIALS

A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.

B. In addition to the requirements of this section, import and/or exported materials shall comply with the requirements of Section 32 24 00.

C. Imported fill materials shall be sampled by the geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.

D. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit all samples to a DSA approved independent testing laboratory for testing.

E. Initial sampling shall be performed by a geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial sample and additional samples from the identified site and shall submit all samples to the approved independent testing laboratory for testing.

F. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.

G. The independent approved testing laboratory shall perform the required tests and report results of all tests noting if the tested material passed or failed such tests and shall furnish copies to the PI, Architect, OAR, DSA, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, Title 24, CCR and the DSA. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report to the DSA as required by Title 24, CCR.

H. Bills of lading or equivalent documentation will be submitted to the PI on a daily basis.

I. Upon completion of import operations, provide the OAR a certification statement attesting that all imported material has been obtained from the identified source site.

3.06 BACKFILLING

A. After concrete has been placed, forms removed and concrete Work inspected, backfill excavations to indicated or required grades. Backfill simultaneously on each side of walls or grade beams. Remove rubbish, debris, and other waste materials from excavations before placing backfill.

B. Before installing any backfill, adequately cure concrete and provide bracing to stabilize structures. Protect waterproofing or dampproofing against damage during backfilling operations

with required protection board. Remove bracing as backfill operation progresses.

C. Do not furnish or install expansive soils for below grade building walls.

D. Install each layer of material in a not to exceed thickness of 6 inches, unless otherwise required.

E. Rigidly control the amount of water to be installed to provide optimum moisture content for type of fill material furnished. Do not over-saturate or compact by flooding or jetting.

F. Install wall backfill before installing railings and fences on walls.

G. Impervious backfill materials shall be installed in layers along with and by the same methods specified for structure backfill. Impervious backfill materials shall be at the approximate grade and elevation and where exposed to erosion, shall be covered with at least a 12 inch layer of fill material as reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

H. Install weep hole drainage at the backside of walls so the backing completely covers the weep holes, is horizontally centered and extends at least 12 inches above the bottom of the weep opening. Provide an 8 inch square section of 1/4 inch galvanized or aluminum screen, with a minimum wire diameter of 0.03 inch, and install at the backside of each weep hole before installing the backfill material.

I. Where a reviewed drainage matting system is provided instead of permeable backfill for retaining structures, install in accordance with the manufacturer recommendations.

3.07 COMPACTING

A. Compact each layer of fill material by tamping, sheepsfoot rollers or pneumatic- tired rollers, to such extent as to provide specified relative compaction. At inaccessible locations, compact to specified requirements with hand-held, operated and directed compaction equipment.

B. Unless otherwise indicated, compact each layer of fill material to a relative compaction of at least 95 percent.

C. Do not compact by flooding or jetting.

D. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each layer of compacted fill before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.

B. The geotechnical engineer, retained by the Owner as an Owner Consultant, will sample imported fill materials from their designated source before delivery to the Project site.

C. Installation of backfill shall be observed by the geotechnical engineer, retained by the Owner as an Owner Consultant.

D. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavation Work before the installation of fill and/or other materials.

E. Compaction: Test compaction in accordance with ASTM D 1557, Method C.

F. DSA will inspect foundation excavations when completed and ready for forms, after forms are in place and before first placement of concrete.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.10 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 10 00
PAVEMENT REPAIR

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:

1. Bituminous Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.
2. Concrete Pavement Repair: Areas heaved by tree roots, cracked areas, holes and trenches, and areas around new structures.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating areas to be repaired.

B. Product Data: Submit manufacturer's technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials specified in Section 31 11 23: Base Course.

B. Materials specified in Section 32 12 16: Asphaltic Paving.

C. Materials specified in Section 32 12 17: Site Concrete Paving.

2.02 BITUMINOUS MATERIALS

A. Provide materials and products of the class, grade or type indicated, conforming to relevant provisions of Section 203 - Bituminous Materials of the latest Standard Specifications for Public Works Construction.

2.03 HEADERS AND STAKES

A. Headers: Redwood, size 2 x 6, unless otherwise indicated on Drawings.

B. Stakes: redwood, Construction Grade.

C. Nails: Common, galvanized, 12d minimum.

2.04 SLURRY

A. Cement-sand slurry; minimum one sack of cement per cubic yard of mixture.

PART 3 - EXECUTION

2.05 PAVEMENT REMOVAL

A. Remove bituminous and concrete pavement in accordance with applicable provisions of Section 300 – “Earthwork” of the Standard Specifications for Public Works Construction.

B. Pavement Heaved By Roots: Remove pavement to limits of distortion and expose roots. Trim roots to provide at least 12 inches clearance to pavement.

C. Remove protruding bituminous surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.

D. Remove raveled and depressed bituminous pavement to limits indicated or required.

E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.

F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

2.06 EXCAVATING, BACKFILLING AND COMPACTING

A. Conform to requirements in Section 31 23 00: Excavating, Backfilling and Compacting; Section 31 23 16: Excavating, Backfilling and Compacting for Pavement; Section 31 23 17: Excavating, Backfilling and Compacting for Structures.

B. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of related Specification sections.

2.07 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.

C. Fasten headers in place with redwood stakes of length necessary to extend into solid earth a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Stakes are to be installed on the asphalt side of the header. Provide a minimum of 2-12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and devices as required to fasten headers.

2.08 BASE COURSE

A. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.

B. Fill grade and compact as specified in Section 31 22 00: Grading.

2.09 RESURFACING

A. Holes and Trenches: Remove loose dirt and backfill with cement-sand slurry allowing for surfacing one inch thicker than existing. Unless otherwise indicated on Drawings, resurface flush with existing adjoining pavement installing the same type of materials and section provided in existing improvements.

B. Other Areas: Other surface improvements damaged or removed shall be cut to a neat even line and excavated one inch below the bottom of the existing pavement. Resurface by following the original grades and installing the same type of materials provided in existing improvements.

C. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth materials before asphalt cools.

2.10 REPAIRING AND RESEALING EXISTING SURFACES

A. Preparation of Surfaces: Prior to filling cracks, clean existing bituminous surfacing of loose and foreign materials and coat with a film of asphalt emulsion.

B. Repair of Existing Surfacing:
   1. Fill cracks 1/2 inch wide and less with RS-1 emulsion and silica sand or other required material. Cracks larger than 1/2 inch wide shall be filled with Type C2 Asphalt Concrete as specified. Cracks shall be filled to the level of adjacent surfacing.
   2. Where low areas, holes, or depressions occur in existing surfacing, repair with emulsified asphalt. Install material, strike off the emulsified asphalt with a straightedge flush with adjoining surfacing. Finish with a steel trowel, and after dehydration, compact by rolling or tamping.

C. Testing: Flood test entire area in presence of the PI. Entire area tested shall be free of standing water or puddles.

D. Surface Seal: After surface has been repaired and tested, install seal coat over entire area indicated. Surface seal shall be as specified in Section 32 12 16.

2.11 CLEANING

A. Remove all stains on the Project site and adjacent properties caused by or attributed to the Work of this section.

B. Remove rubbish, debris, and waste materials and legally dispose of off the project site.

2.12 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 11 23
BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Installation of base material.

C. Related Sections:
   1. Section 31 10 00: Site Clearing.
   2. Section 32 22 00: Grading.
   3. Section 31 23 00: Excavation, Backfilling, and Compaction
   4. Section 32 10 00: Pavement Repair
   5. Section 32 12 16: Asphaltic Paving
   6. Section 32 12 17: Site Concrete Paving

1.02 SUBMITTALS

A. Prior to import, Contractor shall submit written certification to OAR that crushed Miscellaneous Base (CMB) does not contain Polychlorinated biphenyls (PCB) above laboratory detection limits when tested in accordance with EPA Method 8082, and obtain written approval from OAR and FUSD prior to import at the subject site, refer to article 2.02 for sampling frequency.,

B. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The Contractor shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by OAR and FUSD prior to importing the material. A statement on company letterhead from the source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source does not mine ultramafic materials, a source of natural occurring asbestos shall be

C. included in the submittal to OAR and FUSD. The Contractor may request
   1. variance from testing by Section 01 40 00 for CAB. To be considered for a variance, the Contractor shall submit a documentation package, which includes all of the aforementioned information at least 48 hours in advance of planned import.
   2. Frequently used suppliers:
      a. Hansen Aggregates, Irwindale, California.
      b. Vulcan Materials, Reliance Company, Irwindale, California.
      c. Vulcan Materials Durbin, Irwindale, California.

D. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.

E. Sample: Submit Sample of proposed base course material.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

1.04 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 UNTREATED BASE MATERIALS

A. The following base materials shall conform to the requirements of the Greenbook: Standard Specifications for Public Works Construction: Section 200 - Rock Materials.
   1. Crushed Aggregate Base.

2. Crushed Miscellaneous Base.
   a. CMB meeting requirements of article 1.02, A, may be used on-site for pavement base only.
   b. CMB may be used off-site when in accordance to the Greenboook.
   c. Materials generated on site shall not be used as a base course material.

2.02 SOURCE QUALITY CONTROL

A. Sampling and testing of imported and/or exported crushed miscellaneous base (CMB) shall be performed in accordance with the following Table 1 schedule:

VOLUME (CY)	SAMPLING FREQUENCY
0 - 500	1 PER 100 CY
501 - 1,000	1 PER 250 CY
1,001 – 5,000	1 PER 250 CY FOR FIRST 1,000 CY 1 PER 500 CY THEREAFTER
5,001 – 20,000	12 SAMPLES FOR FIRST 5,000 CY 1 PER 1,000 CY THEREAFTER
> 20,000	1 PER 2,000 CY FOR FIRST 20,000 CY 1 PER 2,500 CY

2.03 MATERIAL APPROVAL

A. Base material shall be inspected by the PI for gradation and material content prior to installation. The owner may choose to have additional tests performed by a geotechnical engineer, retained by the Owner, before installation.

PART 3 – EXECUTION

4.01 INSTALLATION

A. Install base course material in layers not exceeding 4 inches in thickness,unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 31 22 00: Grading.

4.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

4.03 CLEANUP

A.

END OF SECTION

SECTION 32 12 16
ASPHALTIC PAVING

PART 1 GENERAL

1.01 REQUIREMENT

A. The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated in the Contract Documents and specified herein.

B. The following types of pavement shall be covered in this Section:
   1. Paving for utility trenching, playgrounds, areas between buildings, adjacent to planting and turf areas, and as indicated on Construction Documents.

C. Related Sections:
   1. Section 31 22 00: Grading.
   2. Section 32 17 23: Painted Pavement Markings.
   3. Section 32 12 36: Seal Coats

1.02 QUALITY ASSURANCE

A. The work provided herein shall conform to and be in accordance with the Contract Plans, General Conditions/Specifications and Special Provisions, as well as the Standard Specifications for Public Works Construction (“GREENBOOK”), Latest Edition, adopted by the Southern California Chapter, American Public Works Association; herein referred to as the “Standard Specifications”.

B. The Owner's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. At the time of delivery to the work site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather. If asphaltic concrete temperature is not within these tolerances the affected batch shall be rejected. Any and all costs due to the rejected asphaltic concrete shall be the responsibility of the paving contractor.

1.03 ESTABLISHMENT OF GRADES

A. The Contractor’s Surveyor will set grade stakes. The Surveyor shall be a California registered land surveyor or licensed Civil Engineer. The Surveyor shall be hired and paid by the Contractor and shall be subject to the approval of the Owner. Contractor shall notify the Owner at least 48 hours before staking is to be started. The Owner will determine if work is ready for staking.

B. All work shall conform to the lines, elevations, and grades shown on the Construction Plans. Three consecutive points set on the same slope shall be used together so that any variation from a straight grade can be detected. Any such variation shall be reported to the Engineer. In the absence of such report, the Contractor shall be responsible for any error in the grade of the finished work.

C. Protect and maintain stakes in place until their removal is approved by the Owner. Grade or location stakes lost or disturbed by Contractor, shall be reset by the Surveyor at the expense of Contractor.

D. Areas having drainage gradients of 2 percent or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.

E. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10-foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.

1.04 SUBMITTALS

A. Mix Designs: The CONTRACTOR shall formulate a job-mix formula using the Hveem method in accordance with Standard Specifications Section 203-6.2 and submit it to the ENGINEER for approval. The resultant mixture shall have Hveem properties conforming to Standard

Specifications Section 203-6.4.3.

B. Samples:
   1. Prior to the delivery of specified aggregate to the site, the CONTRACTOR shall submit samples of the material for the INSPECTOR's acceptance in accordance with Standard Specifications Section 4-1.4. Samples shall be typical of materials to be furnished from the proposed source and in conformance with the specified requirements.
   2. Aggregate base gradation and quality certifications shall be dated within 30 days of the submittal.

C. Certificates
   1. Ten days prior to the delivery of aggregates, asphalt materials, and paving mixes to the project site, the Contractor shall submit to the Engineer certificates and test results of compliance of such materials with these specifications.
   2. Submit certificates of compliance from the supplier for bituminous materials for paint binder, asphaltic concrete, and seal coat.
   3. Submit weigh master's certificates or certified delivery tickets for each truck load of asphaltic material delivered to the project site.
   4. Upon completion of the weed control treatment, and as a condition for final acceptance, furnish a written certificate stating the brand name of the sterilant and the manufacturer, and that the sterilant used had at least the minimum required concentration, and that the rate and method of application complied in every respect with the conditions and standards contained herein.

1.05 QUALITY CONTROL

A. Asphaltic Concrete Producers Qualifications: Use only materials furnished by a bulk asphaltic concrete producer regularly engaged in production of hot mix, hot laid bituminous concrete.

B. Applicator Qualifications: Paving machine and roller operators shall be fully trained and experienced in the installation of asphaltic concrete paving on projects of similar size and complexity.

C. Regulatory Requirements: The quantity of volatile organic compounds (V.O.C.) used in weed killer, seal coat, primer and other materials shall not exceed the limits permitted under the current regulations of the local authorities having jurisdiction.

1.06 ENVIRONMENTAL LIMITATIONS

A. Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
   1. Tack Coats: Minimum surface temperature of 60 deg F.
   2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
   3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

1.07 PAVEMENT MARKING PAINT

A. Refer to section 32 17 23.13: Painted Pavement Markings.

B. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 PRODUCTS

2.01 MATERIALS

A. Base Course Material: Crushed base material shall consist of materials that meet the provisions of Specifications Section 31 22 00 Grading, Part 2.01F.

B. Asphalt Surfacing Materials: Furnish asphalt surfacing meeting the following requirement, furnished from a commercial asphalt central mixing plant.
   1. Paint Binder/Tack Coat: Asphalt emulsion shall be CSS-1 or CSS-1h and shall conform to the requirements of Standard Specifications Section 203-3 Emulsified Asphalt.
   2. Asphalt Concrete Composition & Grading:

a. Playground area surface course asphalt concrete shall conform to Standard Specification Section 203-6.4.3, Type D2, with asphalt content of 4.8% to 6.5%.
b. Parking lots surface course asphalt concrete shall conform to Standard Specification Section 203-6.4.3, Type C2, with asphalt content of 4.6% to 6.0%.
c. Base course asphalt concrete, in all areas, shall conform to Standard Specification Section 203-6.4.3, Type B, with asphalt content of 4.5% to 5.8%.
d. Asphalt performance grade shall be PG-64-10.
e. At least two courses of asphalt shall be laid when Type D2 asphalt pavement is greater than 1-1/2 inches. The surface course shall be a minimum thickness of one inch (1") and a maximum of 1-1/2 inches.
f. At least two courses of asphalt shall be laid when Type C2 asphalt pavement is greater than 3 inches. The surface course shall be a minimum thickness of one inch (1") and a maximum of two inches (2").

C. Weed Control:
1. The soils sterilant shall be in accordance with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant. Sterilant shall be selected as appropriate for the environment in which is it to be placed. Contractor shall be licensed with the State of California to apply sterilant. Sterilant shall be commercial grade for commercial application. Payment for soil sterilization will include full compensation for application and all materials and incidental work required.
2. Apply Dow Elanco Spike 80DF, or approved equal, to subgrade prior to asphalt paving. Spike 80DF weed control should be applied at the rate of seven pounds per acre. If another manufacturer is used follow their recommendations.

D. Headers and Stakes:
1. Headers: Redwood, Construction Heart Grade, size 2 x 6, unless otherwise indicated on construction drawings
2. Stakes: 2 x 4 redwood or 2 x 3 Douglas fir, Construction Grade.
3. Nails: Common, galvanized, 12d minimum.

PART 1 EXECUTION

3.01 HEADERS

A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.

B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.

C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of 2-12d galvanized common nails through each stake.

D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.

F. Provide additional stakes and anchorage as required to fasten headers in place

3.02 SUBGRADE PREPARATION

A. It is required that areas of asphalt pavement be underlain by a layer of aggregate base material which meets the requirements of Specification Section 31 22 00, Part 2.01F. Thickness of base layer is as shown on the Construction Documents.
1. See soils report for recommendations.

B. Subgrade tolerances: Subgrade for pavement shall not vary more than 0.02' from the specified grade and cross section established by the Engineer. Subgrade for subbase or base material shall not vary more than 0.04' from the specified grade and cross section. Variations within the

above specified tolerances shall be compensating so that the average grade and cross section specified are met.

C. Correct irregularities by dressing down or filling as may be required, to bring areas to true subgrade elevations.

D. Where filling is required, scarify the subgrade to bond the new material to the in place material; use additional material as required, subject to the approval of the Architect, and provided by the Contractor.

E. Remove excess material from the site to a legal disposal area.

3.03 APPLICATION GENERAL

A. Finish elevations, extent of asphalt paving and locations of type of asphalt and class of base shall be as indicated and specified herein and on the Construction Documents. Bring subgrade elevations sufficiently below the finish elevations of the paving so as to accommodate the thickness of paving and base.

3.04 STERILANT APPLICATION

A. Place herbicide below base course in all areas of new asphalt pavement. Meet the applicable environmental control requirements. Apply as directed by the manufacturer's printed instructions just before application of the base course. Sterilant shall not be applied within two feet of planting areas.

3.05 APPLICATION OF BASE COURSE

A. Install base course material, encompassing spreading and compacting, in accordance with the S.S.P.W.C. Section 301-2, Untreated Base.

B. After preparing the subgrade as specified in 3.5.A, all traffic on the subgrade shall be avoided. Should it be necessary to haul over the prepared subgrade, the CONTRACTOR shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand tamped. All equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.

C. Continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross-section, will not be permitted. The CONTRACTOR shall protect the prepared subgrade from all traffic.

D. Maintain the surface in its finished condition until the succeeding layer is placed.

3.06 PLACING ASPHALT CONCRETE SURFACING:

A. Asphalt binder (tack coat) shall be applied to all existing pavement surfaces to be overlaid and/or joined per section 302-5.4 of the Standard Specifications. Asphalt binder (tack coat) shall be applied to existing surfaces to be surfaced and between layers of asphalt concrete, except when eliminated by the Engineer. A layer of asphalt binder (tack coat) shall be applied to all vertical-cut faces and between subsequent AC lifts.

B. Asphalt Concrete Pavement:

1. All work shall be in accordance with Section 302-5 of the Standard Specifications, except as noted herein. Asphalt concrete work shall include full-depth patching and variable thick asphalt concrete transition areas. The Contractor shall, on a daily basis, provide the Inspector with copies of certificates of weight for all materials delivered to the job site and/or incorporated in the work. At no time shall the coarse aggregate that has segregated from the mix be scattered across the paved mat.
2. Asphalt concrete shall not be placed on any surface, which contains ponded water or excessive moisture in the opinion of the Engineer. If paving operations are in progress and rain or fog forces a shut down, loaded trucks in transit shall return to the plant, and no compensation will be allowed therefore. The Contractor shall furnish and use canvas tarpaulins to cover all loads of asphalt from the time that the mixture is loaded until it is discharged from the delivery vehicle, unless otherwise directed in writing by the Engineer
3. The Inspector will examine the base before the paving has begun. The Contractor will correct any deficiencies before the paving is started.

4. Asphalt concrete of the class indicated in Section 2.B.2 shall be laid in courses conforming to S.S.P.W.C. Table 302-5.5(A) unless otherwise stated herein.
5. At least two courses of asphalt shall be laid when Type D2 asphalt pavement is greater than 1-1/2 inches. The surface course shall be a minimum thickness of one inch (1") and a maximum of 1-1/2 inches.
6. At least two courses shall be laid when Type C2 asphalt pavement is greater than 3 inches. The surface course shall be a minimum thickness of one inch (1") and a maximum of two inches (2").
7. Successive courses may be laid upon previously laid courses as soon as the previous course has cooled sufficiently to show no perceivable displacement under equipment or loaded material delivery trucks and a tack coat has been applied.
8. Wherever AC pavement does not terminate against a curb, gutter, or another pavement, the Contractor shall provide and install a redwood or pressure treated Douglas fir header at the line of termination.
9. Pavement at all longitudinal joints shall have a Field Density of 95%, as described in 302-5.6.2 of the Standard Specifications. When the test results of the field cores are less than 95% Relative Compaction, the Contractor shall remove a 1-foot-wide section on each side of the longitudinal joint. The Contractor shall replace the removed pavement with an asphalt mix that meets the job specification at no additional cost to the Owner.
10. Pavement tolerances: within 1/8-inch of design thickness and 1/8-inch from design elevation.

3.07 SEAL COAT

A. Allow new asphalt pavement to cure 30 days before application of seal coat. See Project Specification Section 32 12 36: Seal Coats.

3.08 FLOOD TESTING

A. Flood Test: Before acceptance, all pavements shall be water tested to ensure proper drainage as directed by the Inspector. The Contractor shall provide water for this purpose. The flooding shall be done by water tank truck. Depressions where the water ponds to a depth of more than 1/8-inch shall be filled or the slope corrected to provide proper drainage. The edges of the fill shall be feathered and smoothed so that the joint between the fill and the original surface is invisible. No standing water shall remain 1-hour after test.

3.09 FIELD QUALITY CONTROL

A. Replace or repair deficient and damaged asphalt paving.

B. All paving shall drain properly before being accepted. Upon completion, the pavement shall be true to grade and cross section. When a 10 foot straightedge is laid on the finished surface parallel to the centerline of the roadway, the surface shall not vary from the edge of the straightedge more than 1/8 inch, except at intersections or at changes of grade. Any areas that are not within this tolerance shall be brought to grade immediately following the initial rolling. There shall be no variation greater than 1/4 inch plus or minus from a 10 foot straight edge, except at grade changes. The paving material in the area to be repaired shall be removed, by an approved method, to provide a minimum laying depth of 1 inch, or 2 times the maximum size aggregate, whichever is greater, of the new pavement at the join line. Repairs shall not be made to pavement surface by feather-edging at the join lines. All expenses for pavement repair up shall be borne by the Contractor at NO cost to the Owner.

3.10 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.11 CLEAN UP

A. Clean all debris and unused materials from the paving operation. Clean all surfaces that have been spattered or defaced as a result of the paving operation. Asphalt or asphalt stains which are noticeable upon surfaces of concrete, or materials which will be exposed to view, shall be promptly and completely removed. Cleaning shall be done in a manner that will not result in any discharge of contaminated materials into any catch basin. All expenses for clean up shall be borne by the Contractor at NO cost to the Owner.

END OF SECTION

SECTION 32 12 17
SITE CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Portland cement concrete pavement, cement walks, curbs, gutters, trash pick-up area, ramps, mowing strips, fence post footings, sliding gate concrete tracks, catch basins, pipe bedding and encasements, thrust blocks, transition structures, flagpoles and light standard bases and footings, athletic equipment footings and equipment pads.

1.02 SUBMITTALS

A. Shop Drawings: Submit plans, elevations and details of concrete site Work.

B. Product Data: Submit mix designs and manufacturer's technical data for materials and products. Submit 3" x 3" concrete Sample of each specified color.

C. Material Sample: Submit one concrete bumper to the PI for destructive testing.

1.03 QUALITY ASSURANCE

A. Comply with Standard Specifications For Public Works Construction.

1.04 REGULATORY REQUIREMENTS

A. Portland cement concrete paving and concrete finishes:
   1. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with **CBC Sections 11B-302** and **11B-403**.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Concrete, Mortar and Related Materials: Comply with applicable provisions of Standard Specifications for Public Works Construction, Section 201 - Concrete, Mortar and Related Materials:
   1. Concrete: 28-day compressive strength 2,500 psi, unless specified otherwise.
   2. Reinforcing Mesh: ASTM A 185, 4x4/W1.4 x W1.4 welded wire mesh.
   3. Expansion Joint Filler: Preformed expansion joint filler, bituminous type, complying with ASTM D 994.

B. Form Materials:
   1. Side forms: Douglas fir, Construction Grade or Better or metal forms.
   2. Stakes: Douglas fir, Construction Grade or Better or metal stakes.

C. Concrete Parking Bumpers:
   1. Precast concrete, smooth and free of pits and rock pockets, providing a minimum 28-day compressive strength of 3,500 psi. Size at least 7-1/2 inches wide, 5-1/2 inches high and 6 feet long. Reinforce with 2 #5 reinforcing bars. Provide 2-3/4 inch diameter pre-drilled holes for anchor installation.
   2. Bumper Anchors: Provide ½-inch diameter x 18-inch long galvanized steel pipe.
   3. Bumper Adhesive: Provide adhesive recommended by bumper manufacturer/installer for fastening bumpers to concrete pavement.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF FORMS FOR CAST-IN-PLACE STRUCTURES

A. Concrete Pavement: Install Portland cement concrete pavement in compliance with the Standard Specifications for Public Works Construction, Section 302- Roadway Surfacing.

B. Miscellaneous Exposed Concrete: Install concrete curbs, walks, gutters, cross gutters, access ramps, driveways, catch basins, yard boxes, vaults and similar structures, in compliance with the Standard Specifications for Public Works Construction, Section 303 -

Concrete and Masonry Construction.

C. Exposed Concrete Bases: Install bases, such as for post, flagpole, light standards and similar bases, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.

D. Post, flagpole, light standard footings below grade, underground conduit bedding, encasements, thrust blocks and similar structures may be placed in excavations conforming to the required sizes.

E. Reinforcement installation and concrete placement, surface finishes, curing and removal of forms shall be performed in compliance with applicable provisions of Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction. Provide heavy broom finish at slopes exceeding six (6) percent and medium broom finish at slopes up to six (6) percent.

3.02 INSTALLATION OF PARKING BUMPERS

A. Install bumpers as indicated on the Drawings. On bituminous paving, install anchors through pavement and into the ground a minimum of 12 inches. On concrete pavement, install bumpers in a continuous bed of adhesive.

3.03 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.04 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 32 12 18
SITE CONCRETE PAVING REINFOCEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel bars and accessories for cast-in-place concrete.

1.02 REFERENCES

A. ACI 315 - Details and Detailing of Concrete Reinforcing.

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

C. ASTM A82 – Standard Specification for Steel Wire, Plain, For Concrete Reinforcement.

D. ASTM A184 – Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

E. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

F. ASTM A496 – Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.

G. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

H. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

I. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed Bars for Concrete
   1. Reinforcement.

J. AWS D1.4 - Structural Welding Code for Reinforcing Steel.

K. CRSI - Concrete Reinforcing Steel Institute Manual of Practice.

L. Chapter 19A, California Building Code.

1.03 SUBMITTALS

A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI
   1. 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.

B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

1.04 QUALITY ASSURANCE

A. Provide Testing Laboratory with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

B. Comply with the following as a minimum requirement:
   1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
   2. American Welding Society (AWS)
   3. American Concrete Institute (ACI)
   4. 4 CBC, Chapter 19A, Concrete

C. Source Quality Control: Refer to Division 01 Sections for general requirements and o the following paragraphs for specific procedures. Testing laboratory retained by the Owner shall select test Samples of Bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:
   1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.

2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.

D. Certification of Welders: Shop and project site welding shall be performed by welding operators certified by AWS.

1.05 DELIVERY, STORAGE AND HANDLING

A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing material.

B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

1.06 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel: ASTM A 615, or ASTM A706, 60 yield grade deformed low alloy steel for No. 4 bars or larger; 40 yield grade, No. 3 bars for ties and stirrups. Conform to Section 1903A, California Building Code 19A.

B. Welding Electrodes: Low Hydrogen grade E70XX for Grade 40, E90XX for Grade 60.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage black annealed type.

B. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

D. Concrete Blocks: Approximately 3 inches dimension each side.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice and ACI 315 and ACI 318. Wherever possible, make bends to shape in fabricator's shop.
   1. Bars reduced in section will not be accepted.
   2. Bars with kinks are unacceptable.
   3. Bars shall not be heated to facilitate bending or for any other purpose.
   4. Bars with bends not indicated on drawings will not be accepted. Perform no forming in a manner which will damage bars.

B. Weld reinforcement in accordance with AWS D1.4.

C. Locate reinforcing splices not indicated on Drawings at point of minimum stress.

PART 3EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Install concrete blocks to support reinforcement over grade. Smooth face rocks not permitted.

B. Do not displace or damage vapor barrier where vapor barrier is specified or indicated on drawings.

C. Accommodate placement of formed openings.

D. Prior to placing, thoroughly clean reinforcement of all rust, dirt, dust, oil or any other material deleterious to bonding of concrete.

E. means of precast concrete block supports. Point wire tie ends away from the form.

F. Unless otherwise indicated, the number, type, and spacing of supports shall conform to the ACI 315.

G. Accurately place and securely tie reinforcement at all intersections and splices with black annealed wire and securely hold in position during placing of concrete by

H. During placing of structural concrete slabs, provide a full-time reinforcing steel placer to repair and replace reinforcing to its proper location. Provide additional chairs of the proper size available to place under bars displaced during the concrete pouring operation.

I. Dowels for Walls: Securely tie in place prior to placing of concrete. Do not place dowels in concrete after pour.

J. Dowels for Slabs: Securely tie in place prior to placing concrete. Per Plans or Drawings. Do not place dowels in concrete after pour.

K. Conform to Section 1907A, California Building Code for concrete cover over reinforcement.

3.02 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

A. Protect the Work of this section until Substantial Completion

END OF SECTION

SECTION 32 12 36
SEAL COATS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt Pavement Sealcoating

1.02 REFERENCE STANDARDS

A. American Society for Testing Materials (ASTM)
   1. D 2939-03 Standard Test Methods for Emulsified Bitumens Used as Protective Coatings
   2. The following ASTM test methods: D140, D466, D529, D244, C88, C131, C117, C127, C123, D1310, D2170, D95, D402, D2171, D5, D113, D2042, D711, D969, D1475, D3960, D2486, E70, D562, D3583, D3236, D5249, D6690, B117, D977
   3. Asphalt Pavement Sealer meets ASTM D8099/D8099M-17 Standard Specification for Asphalt Emulsion Pavement Sealer.

B. South Coast Air Quality Management District
   1. SCAQMD Method 304 – Determination of Volatile Organic Compounds (VOC) In Various Materials.

C. Federal Specifications for Waterborne Traffic and Airfield Marking Paints
   1. TT-P-1952E Types I, II, and III
   2. TT-P-1952D
   3. TT-P-1952B

1.03 SUBMITTALS

A. Product Data
   1. Submit manufacturer's Product Data Sheet.

1.04 PROJECT/SITE CONDITIONS

A. Ambient Conditions
   1. Both surface and ambient temperature must be a minimum of 50°F and rising before applying cold applied crack fillers, oil spot primers, pavement sealers or traffic paints (materials). Ambient and surface temperature shall not drop below 50°F for a 24 hours period following application of materials.
   2. Apply materials during dry conditions when rain is not imminent or forecast for at least 24 hours after application.

B. Pavement/Surface Conditions
   1. Newly placed (paved) asphalt pavement surfaces should be allowed to cure a minimum of four (4) weeks under ideal weather conditions (70°F) before applying coatings.
   2. New pavement surfaces shall be free of residual oils or chemicals associated with the placement of new asphalt pavement.
   3. Aged pavement surfaces shall be cleaned and prepared as recommended in this specification under PART 3 Sections 3.1 thru 3.7 of this specification.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine pavement surface prior to performing work

B. Notify architect or project engineer of any adverse or unacceptable conditions that would affect successful repair efforts or application of materials

C. Do not commence work until unacceptable conditions are corrected

3.02 SURFACE PREPARATION

A. Surface must be clean and free from all loose material and dirt. Remove grass along edge of pavement to find true edge of pavement. Power blowers, mechanical sweeping devices and push brooms are acceptable cleaning methods.

3.03 CRACK REPAIR

A. Cold Applied Crack Filling Materials and Methods
   1. Clean cracks of all dirt, debris and vegetation prior applying crack filling.
   2. For cracks up to ½" apply Crack Sealant.
   3. For cracks larger than ½" wide and up to 1" wide apply Trowel Grade Crack Filler or Patching material. Apply Trowel Grade or with trowel, squeegee or straightedge. Allow to dry before sealcoating.
   4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Trowel Grade Crack Filler.

B. Hot Applied Crack Sealant/Filling Materials and Methods
   1. Cracks must be free from dust, dirt, vegetation and moisture. Clean cracks with mechanical wire brush followed by a compressed air heat lance to remove loose debris and moisture.
   2. For all cracks up to 1" wide apply either Parking Lot Grade crack sealant or Supreme crack sealant.
   3. Parking Lot Grade crack sealant shall be melted in a conventional oil-jacketed unit equipped with an agitator.
   4. Apply heated Parking Lot Grade crack sealant using a pump and wand system, a crack banding unit or a pour pot.
   5. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Parking Lot Grade Crack Sealant.

3.04 ALLIGATORED PAVEMENT REPAIR

A. Repair Alligator Cracks with
   1. Remove all dirt, dust and vegetation on alligatored areas
   2. Apply Crack Sealant with trowel, squeegee or straightedge.
   3. Allow to dry before sealcoating.
   4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Crack Sealant.

B. Repair Alligator Cracks with Infrared Heater Method
   1. Remove all dirt, dust and vegetation on alligatored area.
   2. Heat alligatored pavement area to a temperature between 290°F and 325°F to soften pavement. Scarify heated softened asphalt with an asphalt rake to a depth of 2-3 inches. Add Asphalt Binder Plus at a rate of .20 gallon per square yard while pavement material is still soft and workable. Mix Asphalt Binder Plus into heated softened asphalt with the asphalt rake. Level smooth with rake and compact area with either a plate compactor or asphalt roller. Note- A small amount of fresh Hot Mix blacktop may be added to heated material if needed to assure a smooth, flush finish to adjoining pavement surface.
   3. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Asphalt Binder Plus.

C. Repair Alligator Cracks with Full-Depth Hot Mix Asphalt
   1. Saw cut and remove the alligatored pavement to the depth necessary to reach firm support (firm base materials).
   2. Prime bottom of patch area and vertical sides of saw cut with Asphalt Binder Plus.
   3. Fill patch area with fresh hot mix asphalt.
   4. Compact fresh hot mix with hand tamper, vibratory-plate compactor or asphalt roller. Finished patchwork shall be flush and level with adjoining pavement.
   5. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Asphalt Binder Plus.

3.05 POTHOLE REPAIR

A. Fill Potholes with Pothole Patch
   1. Remove loose material, debris and standing water from pothole prior to application.

2. Apply Pothole Patch directly from bag into pothole
3. Compact Pothole Patch with a hand tamper, vibratory-plate compactor or asphalt roller. Finished patchwork shall be flush and level with adjoining pavement.
4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Pothole Patch.

3.06 OIL SPOT PRIMING

A. Prime Oil Spots with Prep Seal or Petro Seal
1. Wipe or scrape excessive build-up of oil, grease, and gasoline spots. A torch may be used to burn away any residual.
2. Apply oil spot primer with brush, roller or sprayer.
3. Allow to dry before sealcoating.
4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Prep Seal or Petro Seal.

3.07 LINE BLOCK-OUT PAINT

A. Applying Line Block-Out Paint
1. Remove all loose material and dirt from existing traffic markings.
2. Apply Line Block-out paint with pressurized spray equipment, brush or roller.
3. Allow to dry before sealcoating.
4. Contractor or other Entity Responsible for performing work shall refer to Manufacturer's Product Data Sheet for more detailed application instructions for Line Block-Out Paint.

3.08 MASTERSEAL APPLICATION

A. Applying Sealer
1. Remove all loose material and dirt from pavement surface. Remove grass along edge of pavement to find true edge of pavement. Power blowers, mechanical sweeping devices and push brooms are acceptable cleaning methods.
2. Equipment used to apply Sealer shall have continuous agitation or mixing capabilities to maintain homogeneous consistency of pavement sealer mixture throughout the application process. Spray equipment shall be capable of mixing and spraying pavement sealer with sand added. Self-propelled squeegee equipment with mixing capability shall have at least 2 squeegee or brush devices (one behind the other) to assure adequate distribution and penetration of sealer into pavement surface. Hand squeegees and brushes shall be acceptable in areas where practicality prohibits the use of mechanized equipment.
3. Sealer shall be mixed in accordance with the following mix design (based on 100 gallons of Sealer for ease of calculation):
   Sealer ……. 100 gallons
   Water……. 15-25 gallons
   Top Tuff…… 1 gallon
   Sand (40 to 70 mesh AFS fineness gradation)…….300-500 lbs.
4. Apply two coats of mixed Sealer at a rate of .11 to .13 gallon per square yard per coat to entire pavement area. Allow first coat to dry thoroughly before applying second coat.
5. Apply a third coat of mixed Sealer at a rate of .11 to .13 gallon per square yard to high traffic areas including parking area entrances, exits and drive lanes (or as specified in additional diagrams or drawings). Allow second coat to dry thoroughly before applying a third coat to these areas.
6. Allow final coat of pavement sealer to dry 24 hours prior to applying Sealer 100 % Acrylic Water based Traffic Paint.

3.09 TRAFFIC MARKINGS/LINE STRIPING

A. Applying Traffic Paint
1. Remove all loose material and dirt from existing pavement. Freshly applied pavement sealer shall be allowed to cure for a minimum of 24 hours prior to applying Traffic paint.
2. Apply Traffic Paint with pressurized line striping spray equipment at wet thickness of 15 to 20 mils.

3. Apply Handicap Blue to all handicap parking spots.
4. Apply Firelane Red Traffic Paint to areas designated as Fire Zones (by specifier).
5. Allow paint to dry thoroughly prior to opening to traffic.

END OF SECTION

SECTION 32 24 00
ENVIRONMENTAL IMPORT AND EXPORT MATERIALS TESTING

PART 1 – GENERAL

1.01 SUMMARY

A. This Specification defines:
   1. CONTRACTOR requirements for use of existing, imported or generated materials on school sites.
   2. CONTRACTOR requirements for stockpiling materials for use on school sites.
   3. CONTRACTOR requirements for exporting materials from a school site including transportation.
   4. Testing requirements for all materials imported, exported stockpiled or generated for use on a school site.
   5. CONTRACTOR testing and reporting requirements.
   6. CONTRACTOR submittal requirements.

1.02 OBJECTIVES

A. Ensure that fill materials imported to school sites are safe for students, staff and visitors.

B. Ensure that materials exported from school sites for use at school and non- school sites or offsite disposal/recycling are adequately characterized for lawful disposition.

C. Ensure that representative data be collected so that analytical determinations can be made in regard to the first two objectives.

D. Require CONTRACTOR to contact with and pay for the services of a licensed environmental professional (licensed State of California Professional Engineer [PE Civil], Professional Geologist [PG] or Registered Environmental Assessor II [REA II]) familiar with environmental site assessment and waste classification and disposal requirements.

E. Require CONTRACTOR to contract with and pay for an independent, approved California Department of Health Services certified testing laboratory to perform sampling and testing of imported, exported and site generated fill materials.

F. Require CONTRACTOR to pay all fees required by authorities having jurisdiction over area.

G. Require CONTRACTOR to post bonds required by authorities having jurisdiction over area.

1.03 SUBMITTALS

CONTRACTOR shall submit to OWNER'S Authorized Representative (OAR) for transmittal to FUSD.

A. A qualifications statement for CONTRACTOR'S independent California certified testing laboratory and required licensed environmental professional (California Professional Engineer [PE civil]), Professional Geologist [PG] or Registered Environmental Assessor II [REA II] prior to the start of Work. CONTRACTOR'S licensed environmental professional must possess recent demonstrated environmental experience in soil sampling and waste classification.

B. A draft import/export Sampling Strategy Plan (SSP) prepared by CONTRACTOR'S licensed environmental professional for review and concurrence by OAR and FUSD. The objective of the SSP is to obtain representative sample data. The Draft SSP must be submitted at least 72 hours prior to all proposed import/export sampling activities.

At a minimum, the Draft SSP shall include a site map which shows the location of the proposed import/export and the location and number of the proposed stockpile samples. The Draft SSP shall also contain information pertaining to the total volume of the stockpile proposed for sampling and the rationale in support of the proposed sampling approach. Existing

environmental documentation specific to the import/export site shall be utilized by the CONTRACTOR'S environmental professional to support the proposed sampling approach and analytical method suite. For new school sites, this information would include a DTSC approved site investigation report, e.g., Preliminary Environmental Assessment (PEA). It is the responsibility of the CONTRACTOR to request this information in advance from the OAR if they

do not already have access to a copy at the jobsite.

Lacking this information or rationale, samples shall be analyzed for all analytical methods described in Section 3.01. Guidance for the minimum number of samples per stockpile volume is provided in Table 1 (supplemental samples may be required by FUSD if pothole stockpile sampling is utilized.) In addition, the draft SSP shall contain all necessary contact information for the import/export site and a proposed schedule for the sampling activities.

To expedite the review process, the Draft SSP shall be submitted electronically to FUSD in MS WORD format.

Upon revision of the draft SSP by the CONTRACTOR'S licensed environmental professional and acceptance by OAR and FUSD four revised copies of the final SSP will be provided to the OAR for distribution to FUSD and the project file.

C. A draft Certification/Sample Data Report prepared by CONTRACTOR'S licensed environmental professional for review and concurrence. At a minimum the draft Certification/Sample Data Report shall contain:
   1. A site map showing the location of the stockpile and stockpile sample locations;
   2. A detailed discussion and evaluation of the laboratory results;
   3. A summary of findings and recommendations that provide a determination on the waste classification of the subject materials, based on the representative sample results;
   4. Recommendations for additional steps, if any;
   5. A chain-of-custody forms and all laboratory data with respective QA/QC sheets.

   To expedite the review process, the Draft SSP shall be submitted electronically to FUSD in MS WORD format.

   Upon revision of the draft Certification Report by the CONTRACTOR'S licensed environmental professional and acceptance by the OAR and FUSD three copies of the final report will be submitted to the OAR for distribution to FUSD and the project file and one copy to FUSD.

D. The Environmental Compliance Manager shall confirm that the proposed waste classification for the proposed import/export material is appropriate. For materials designated unacceptable for export except to a licensed facility, the Environmental Compliance Manager shall provide information on the necessary waste manifest documentation.

E. Written documentation (e-mail is acceptable) verifying that all export soil for any soils exported for use at a non-school site, including the final Certification Report prepared by CONTRACTOR's licensed environment professional, were provided to provide to the proposed recipient prior to export and delivery.

F. Written documentation, in the form of a memo or email from CONTRACTOR to OAR, prior to import/export, verifying that the hauling contract specifies 'clean' trucks and that the actual haul trucks utilized for import/export activities will be clean of visible contamination or deleterious materials.

G. Written documentation that the trucks went directly from the source location to the recipient location with no detours or stops at other locations and that short loads were not augmented by other materials that were not tested as part of the final import/export SSP. It is the CONTRACTOR'S responsibility to document that no other trips or short-load augmentation occurred and submit the documentation within five (5) business days of the completion of the import/export activities. All import/export transportation activities shall be conducted in accordance with all applicable (local, State, Federal) rules and regulations.

H. Certification, in the form of haul tickets or completed waste manifests, documenting the volume and recipient of all import/export materials and activities. This documentation shall be coordinated through the OAR, PI and FUSD.
   1. For approved import/export to new school sites, unregulated facilities (landfill) or non-school sites, haul tickets may be utilized, but shall contain the following minimum information:
      a. Date of haul activity
      b. Address of source
      c. Address of recipient

d. Load volume
e. Time of departure from source
f. Time of arrival at recipient site
g. Signature of recipient or recipient's agent

2. For export to regulated facilities (landfills, recyclers, etc.), the appropriate waste manifest must be completed and a copy of the executed manifest, signed by the receiving site, must be provided to the OAR. The waste manifest copy, signed by the receiving facility and based on the manifest address, will be sent directly to FUSD.

1.04 APPROVALS

A. NO import or export of earth or geotechnical grading or filling materials can occur at FUSD sites without PRIOR approval by FUSD.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Imported
1. Soils. Soils proposed for import shall be tested pursuant to the requirements of this Section (32 24 00), unless a variance has been requested by CONTRACTOR and approved by OAR and FUSD prior to the import of the subject materials.
2. Gravels. Clean gravel, consisting of native rock from a commercial source, may be granted a variance from the testing requirements of this Section provided a request for variance is submitted by CONTRACTOR for review and approval at least two weeks prior to import. CONTRACTOR shall provide written documentation, which identifies the source, volume and proposed transport date of the material for review and a letter signed and stamped from either a California Professional Engineer or Geologist stating the quarry does not mine ultra-mafic (i.e. natural asbestos containing) materials. The request for variance requires approval by OAR and FUSD prior to CONTRACTOR importing the materials.
3. Miscellaneous Material. No miscellaneous material containing crushed concrete, asphalt, construction debris, or other potential deleterious materials may be utilized or imported to FUSD project site for use as fill or grading materials of any sort without prior testing by CONTRACTOR pursuant to the subject Section (32 24 00) and approval by the OAR and FUSD.

B. Exported
1. Soils. Soils proposed for export shall be tested pursuant to the requirements of the subject section, unless a variance has been requested by CONTRACTOR and approved by OAR and FUSD prior to the import of the subject materials. (Note: Once soils or other materials for export have been tested, they cannot be disturbed or reused for any purpose without prior approval by the OAR and FUSD.
2. Gravels. Gravels or other natural rock material shall not be exported from a FUSD project without prior testing by CONTRACTOR pursuant to this Section (32 24 00) and/or approval by the OAR and FUSD.
3. Miscellaneous Material. No miscellaneous material or other natural rock material shall not be exported from a FUSD project without prior testing by CONTRACTOR pursuant to this Section (32 24 00) and/or approval by the OAR and FUSD.

C. Site Generated
1. Soils. Soils proposed for export shall be tested pursuant to the requirements of this Section (32 24 00), unless a variance has been requested by CONTRACTOR and approved by OAR and FUSD prior to the export of the subject materials. (Note: Once soils or other materials for export have been tested, they cannot be disturbed or reused for any purpose without prior approval by the OAR and FUSD.
2. Gravels. Gravels or other natural rock materials shall not be exported from a FUSD project site without prior testing by CONTRACTOR pursuant to this Section (32 24 00) and/or approval by the OAR and FUSD.

3. Miscellaneous Material. NO crushed miscellaneous material containing concrete, asphalt, construction debris, or other potential deleterious material that is generated onsite may be used as fill or grading material of any sort at a FUSD project site without prior testing and approval by OAR and FUSD. The onsite use of crushing equipment requires prior concurrence by OAR and FUSD. Crushed asphalt shall be segregated and stockpiled separately.
4. Import and Export of fill Materials:
   a. Fees: CONTRACTOR shall pay as required by authorities having jurisdiction over area.
   b. Bonds: CONTRACTOR shall post as required by authorities having jurisdiction over area.

PART 3 - EXECUTION

3.01 SAMPLING AND TESTING

A. CONTRACTOR shall contract with, and pay for, the services of a licensed environmental professional (licensed State of California Professional Engineer [PE Civil], Professional Geologist [PG] or Registered Environmental Assessor II [REA II]).

B. CONTRACTOR shall contract with, and pay for, and independent, approved California Department of Health Services certified testing laboratory to perform sampling and testing of imported, exported and site generated fill materials. [Note: Utilization of portable, onsite crushing equipment on FUSD sites also requires prior notification and approval by OAR and FUSD.]

C. All fill/grading material, unless otherwise specified in writing by OAR and FUSD whether imported or exported, must be tested at the site or origin. Import/export testing and certification process shall include the following steps:
   1. Stockpile all materials for sampling (standard stockpile or backhoe pothole stockpile). Crushed fill materials generated by CONTRACTOR at a school site must be segregated by material. (e.g., separate stockpiles for concrete, asphalt. etc.)
   2. Submit Draft SSP for review and concurrence by OAR and FUSD.
   3. Collect and analyze samples (see Table 1 for number of samples per volume) per SSP. Once fill materials for export have been stockpiled and tested, they may not be used onsite for any purpose without prior approval by OAR and FUSD.
   4. Submit draft import/export sample data report for review and concurrence by OAR and FUSD.
   5. Submit final import/export sample data report (Certification Report to OAR and FUSD for concurrence or proposed waste classification. All certified material not utilized or exported within a period of 90 days will be subject to retesting unless a variance is requested by CONTRACTOR and is approved by OAR and FUSD prior to use or import/export of the subject materials.
   6. Submit required pre import/export documentation/record to the OAR (e- mail).
   7. Submit post import/export certifications to the OAR and FUSD.
   8. In addition to the preceding, requirements, certifications and submittals as indicated in previous subsections above.

   OWNER retains the right to refuse any fill materials proposed for use at a school site.

D. Import/export fill materials shall be stockpiled by CONTRACTOR (or at export site) and are deemed acceptable for import/export or reuse only when it is demonstrated to the satisfaction of OAR and FUSD that the subject materials meet the requirements of this Section.

E. As described in Section 1.03B, lacking site-specific data or sample rationale to support a more focused analytical approach; the CONTRACTOR shall analyze all samples for the following substances according to the methods indicated below. Table 3 is a waste classification flowchart for use by CONTRACTOR'S environmental professional. In all cases, detection levels and quality assurance/quality control methods shall be in accordance with standard Method reporting limits and best laboratory practices and the following USEPA (EPA) methods:
   1. Total Petroleum Hydrocarbons, utilizing EPA Method 8015M, for gasoline and diesel.
   2. Volatile Organic Compounds, utilizing EPA Method 8260B/ 5035.

3. Polychlorinated biphenyls, utilizing EPA Method 8082.
4. Semi-Volatile Compounds, utilizing EPA Method 8270C.
5. Organocholorine Pesticides, utilizing EPA Method 8081 A.
6. Organophosphorous Pesticides, utilizing EPA Method 8141A.
7. Chlorinated Herbicides, utilizing EPA Method 8151A.
8. California Code of Regulations Title 22 (CAM 17) Metals, utilizing EPA Method 6010B/7470A.
9. Hexavalent Chromium, utilizing EPA Method 7199.
10. Arsenic/Thallium, utilizing EPA Method 6020.

F. Import/export fill material may be deemed defective for use by FUSD at a school site if any of the following results are obtained.
   1. Total Petroleum Hydrocarbons are present at concentrations exceeding 100 milligrams per kilogram (mg/kg) for gasoline and 1,000 mg/kg for oil/diesel and long chain hydrocarbons.
   2. Solvents and other volatile organic compounds are present at concentrations exceeding the laboratory reporting limit.
   3. Polychlorinated biphenyls are present at concentrations exceeding the laboratory reporting limit.
   4. Semi-volatile compounds are present at concentrations exceeding the laboratory reporting limit.
   5. Organochlorine pesticided are present at concentrations exceeding the laboratory reporting limit.
   6. Organophosphorous pesticides are present at concentrations exceeding the laboratory reporting limit.
   7. Chlorinated herbicides are present at concentrations exceeding the laboratory reporting limit.
   8. California Code of Regulations Title 22 (CAM 17) Metals at concentrations exceeding site-specific background.
   9. Hexavalent chromium is present at concentrations exceeding 15 mg/kg.

G. Evaluate concentrations of metals in import fill by conducting the analysis set forth below.
   1. Compare the maximum detected metal concentrations in import/export fill samples to the site-specific background levels provided in the site Preliminary Environmental Assessment (PEA) Report. The PEA Report shall be available from the OAR. If any metal concentration exceeds its listed background value, the fill material fails and shall be deemed defective and unacceptable for use unless supported by a site specific health risk assessment.
   2. In addition to section 3.01.G.1, import/export fill shall be deemed environmentally defective and unacceptable for use if any of the following results are obtained:
      a. Arsenic concentrations exceed 12.0 mg/kg.
      b. Lead concentration exceeds 255 mg/kg or fails TTLC/STLC.
      c. Import/Export materials at new school sites with total lead concentrations greater than 50 mg/kg shall be analyzed for leach ability (STLC/TTLC) prior to export. Materials exceeding STLC limits identified in Table 2 are deemed defective and unacceptable for use at school sites.
      d. Import/Export materials at new school sites with total chromium concentrations greater than or equal to 100 mg/kg shall be tested for hexavalent chromium.

H. All export/import fill material shall be characterized, handled, and documented in accordance with applicable US EPA and State of California hazardous waste and hazardous materials regulations (See Table 2). For the purpose of this specification, “contaminated” shall mean any soil or geotechnical material at a concentration, which would require disposal at a regulated facility (i.e., California hazardous or RCRA hazardous). OAR must be notified at least 72 hours prior to the disposal of any hazardous waste or hazardous material. No material disposal or reuse can take place without prior written approval of OAR and FUSD.

I. Specification test results and OAR and FUSD approvals shall be valid for a period of 90 days from the date of the subject testing unless a variance is requested by CONTRACTOR and approved by OAR and FUSD. Previously approved materials shall not be utilized or disposed offsite after the 90 day limit without prior review and approval by OAR and FUSD.

J. Requests for variances to this Specification shall be submitted in writing to OAR and FUSD a minimum of two weeks in advance of need for review and approval. The request for variance must provide all available testing data, a rationale to support the request and to have an active funding line (provided by OAR) to facilitate review by OAR and FUSD will review the request for variance and will provide its preliminary determination within two weeks. Certain requests may require final approval by the Department of Toxic Substances Control (DTSC).

K. Soils with concentrations above Section screening levels may, upon prior approval by OAR and FUSD, be reused at other school sites if supported by a site-specific human health risk assessment.

3.02 TRANSPORTATION

A. Details of the samples and testing must be submitted to and approved by OAR and FUSD before transportation.

B. Haul Routes and Regulations/Restrictions: CONTRACTOR must comply with requirements of project EIR (CEQA) and authorities having jurisdiction over the project area and the proposed activities (e.g. Regional Water Quality Control Board, Department of Toxic Substances Control, etc.).

C. CONTRACTOR shall pay all fees required by authorities having jurisdiction over area.

D. Contractor shall pay all fees for disposal and/or processing of contaminated and/or hazardous fill materials at a regulated facility.

E. CONTRACTOR shall post and pay for all bonds required by authorities having jurisdiction over area.

END OF SECTION

SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative steel fences and Gates.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.

C. ASTM D523 - Standard Test Method for Specular Gloss 2014 (Reapproved 2018).

D. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints 2002 (Reapproved 2017).

E. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings 2013 (Reapproved 2018).

F. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments 2008, with Editorial Revision (2017).

G. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates 2021.

H. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) 1993 (Reapproved 2019).

I. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test 2022.

J. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets 2016.

1.04 REGULATORY REQUIREMENTS

A. Fences, gates, and hardware:
   1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with **CBC Section *11B-404***.
   2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½ inch of the gate surfaces to prevent catching on the clothing or persons. **California Referenced Standards *Code T-24 Part 12,* Section *12-10-202 Item F***.
   3. Swing doors and gate surfaces within 10” of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16” of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped **CBC Section 11B-404.2.10**.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

C. Manufacturers Installation Instructions

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.07 WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bases of Design:
   1. Ameristar Ornamental Fence System; Montage II welded and Rackable: www.ameristarfence.com/#sle.
   2. Or approved Equal.

2.02 MATERIALS

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft2 (276 g/m2), Coating Designation G-90.

B. Materials:
   1. Pickets shall be 1” square x 14 Ga. tubing
      a. Picket holes in the rail shall be spaced 4.715” o.c.
   2. Rails shall be steel channel, 1.75” x 1. 75” x .105”
   3. Fence posts minimum size, 3" 12 Ga.
   4. Gate posts minimum size, 3" 12 Ga.

2.03 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar’s proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting or exceeding the following performance requirements of ASTM F2408:
   1. Adhesion: Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
   2. Corrosion Resistance: Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8” coating loss from scribe or medium #8 blisters).
   3. Impact Resistance: Impact Resistance over 60 inch lb. (Forward impact using 0.625” ball).
   4. Weathering Resistance: Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

E. Swing gates shall be fabricated using 1.75” x 14ga Forerunner double channel rail, 2” sq. x 12ga. gate ends, and 1” sq. x 14ga. pickets. Gates that exceed 6’ in width will have a 1.75” sq. x 14ga. intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Cable kits will be provided for additional trussing for all gates leaves over 6’

F. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48” width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5” x 6” footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5” - 1.375”) and vertical (0 - .5”). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
   1. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer.

B. Set fence posts in accordance with the manufacturer recommended spacing.
   1. Posts shall be set in concrete footings as detailed on drawings

C. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.

3.02 MANUFACTURES’ WARRANTY REQUIREMENTS

A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces:
   1. Remove all metal shavings from cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
   3. Apply 2 coats of custom finish paint matching fence color.

B. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces.

C. Use only Ameristar parts or components

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

3.04 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

C. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

D. Touch up scratched surfaces using manufacturers' materials

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 33 13
SITE BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior bicycle racks.

1.02 RELATED REQUIREMENTS

A. Section 32 13 13 - Concrete Paving

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Installation methods.

C. Shop Drawings: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle racks with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Bicycle Racks:

B. Bases-of-Design:
   1. Manufacturer: Ground Control Systems
   2. Product: CAPTION - CAP201

C. Substitutions: See Section 01 63 00 - Product Substitution Procedures

2.02 BICYCLE RACKS

A. Exterior Bicycle Racks: Device allows three points of locking contact for user-provided lock to secure each bicycle parked.
   1. Style: Hoop Runner
   2. Capacity: Two bicycles.
   3. Mounting, Ground: Surface flange.
   4. Finish: DuraPlas Black Thermoplastic , maintenance-free and weather-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

C. Do not begin installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install level, plumb, square, and correctly located as indicated on drawings.

C. Surface Flange Installation: Anchor bicycle racks securely in place with 3/8 inch by 3-3/4 inch 16-UNC wedge anchor.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 33 14
BICYCLE LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bicycle lockers.

1.02 RELATED REQUIREMENTS

A. Section 32 13 13 - Concrete Paving

1.03 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle lockers with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bases-of-Design:
   1. Manufacturer: Ground Control Systems
   2. Product: Fiberglass Bike Locker - ABSCO-301

B. Substitutions: See Section 01 63 00 - Product Substitution Procedures.

2.02 BICYCLE LOCKERS

A. Secure storage enclosure fabricated of fiberglass reinforced plastic with factory applied finish and factory installed hardware.
   1. Capacity: 1 bicycle per unit.
   2. Door Hinge: Continuous 14 gage stainless steel.
   3. Lock Hardware: Manufacturer's standard stainless steel style lock and padlock adapter.
   4. Ground Mounting: Leveling and anchoring system consisting of feet adjustable up to 5 inches vertically and flanges suitable for bolts or post-installed anchors..
   5. Configuration: Grouped mounting.
   6. Finish: Stipple texture.
   7. Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle lockers.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Do not begin installation until unsatisfactory substrates have been properly repaired.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle lockers are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install bicycle lockers level, plumb, square, and correctly located as indicated on the drawings.

C. Surface Flange Installation: Anchor bicycle lockers securely in place with 1/2 inch by 4 inch anchor bolts through flange holes.

D. Freestanding Installation: Place in location shown on drawings.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 33 14 16
SITE WATER DISTRIBUTION SYSTEM

PART 1- GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Site water distribution systems located at least 5 feet outside the building perimeter, extending to an existing water line or meter.

C. Related Sections:
   1. Section 31 23 00: Excavating, Backfilling and Compaction.
   2. Section 32 10 00: Pavement Repair.

D. Shop Drawings: Submit site plan indicating locations of lines, valves, and related appurtenances.

E. Product Data: Manufacturer's catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

F. Certificates: Certificates attesting that tests set forth in referenced publications have been performed, and the performance requirements have been satisfied.

1.02

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:
   1. ANSI:
      a. ANSI B16.18 Cast Copper Alloy Solder Joint Pressure Fittings.
      b. ANSI B18.5.2.1M Metric Round Head Short Square Neck Bolts. c.
   2. ASME:
      a. ASME B16.3 Malleable Iron Threaded Fittings.
      b. ASME B16.4 Cast Iron Threaded Fittings.
      c. ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
      d. ASME B16.26 Cast Copper Alloy Fitting for Flared Copper Tubes.
      e. ASME B18.2.2 Square and Hex Nuts (Inches Series).
      f. ASME B18.5.2M Metric Round Head Square Neck Bolts.
   3. ASTM:
      a. ASTM A 47 Ferric Malleable Iron Castings.
      b. ASTM A 48 Gray Iron Castings.
      c. ASTM A 53 Pipe, Steel, Black and Hit-Dipped, Zinc-Coated Welded and Seamless.
      d. ASTM A 307 Carbon Steel bolts and Studs, 60,000 psi Tensile Strength.
      e. ASTM A 563 Ductile Iron Castings.
      f. ASTM A 563 Carbon and Alloy Steel Nuts.
      g. ASTM B 61 Steam or Valve Bronze Castings.
      h. ASTM B 62 Composition Bronze or Ounce Metal Castings.
      i. ASTM B 88 Seamless Copper Water Tube.
      j. ASTM C 94 Ready-Mixed Concrete.
      k. ASTM D 1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.
      l. ASTM D 1785 Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
      m. ASTM D 2235 Solvent Cement for ABS Plastic Pipe, and Fittings.
      n. ASTM D 2241 PVC Plastic Pipe Fittings, Schedule 40.
      o. ASTM D 2282 ABS Plastic Pipe.
      p. ASTM D 2466 PVC Plastic Pipe Fittings, Schedule 80.
      q. ASTM D 2468 ABS Plastic Pipe Fittings, Schedule 40.

r. ASTM D 2564 PVC Plastic Piping Systems.
s. ASTM D 2774 Underground Installation of Thermoplastic Pressure Piping.
t. ASTM D 2855 Making Solvent-Cemented Joints with PVC Pipe and Fittings.
u. ASTM D 3139 Joints Pressure Pipes Using Flexible Elastomeric Seals.
v. ASTM F 402 Safe Handling Of Solvent Cements, Primer and Cleaners Used for Joining Thermoplastic Pipes and Fittings.
w. ASTM F 477 Elastomeric Seals for Joining Plastic Pipes.

4. American Water Works Association (AWWA) Standards:
   a. AWWA C104/A21.4 Cement-Mortar Lining For Ductile-Iron Pipe and Fittings For Water
   b. AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids.
   c. AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron pressure Pipe and Fittings.
   d. AWWA C153/A21.53 Ductile-Iron Compact Fittings,3 inches through 16 inches, for Water and Other Liquids.
   e. AWWA C500 Gate Valves for Water and Sewage Systems.
   f. AWWA C503 Wet- Barrel Fire Hydrants.
   g. AWWA C508 Swing-Check Valves for Waterworks Service, 2 inches through 24 inches NPS.
   h. AWWA C509 Resilient-wedge seated Gate Valves for Water and Sewerage Systems.
   i. AWWA C511 Reduced-Pressure Principal Backflow- Prevention Assembly.
   j. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.
   k. AWWA C651 Disinfecting Water Mains.
   l. AWWA C 800 Underground Service Line valves and Fittings.
   m. AWWA C900 PVC Pressure Pipe, 4 inches through 12 inches, for Water Distribution.
   n. AWWA M23 PVC Pipe - Design and Installation.
5. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
   a. MSS SP-80 Bronze Gate, Globe, Angle and Check Valves.
6. Uni-Bell PVC Pipe Association (UBPPA):
   a. UBPPA UNI-B-3 Installation of PVC Pressure Pipe.
   b. UBPPA UNI-B-8 Direct Tapping of PVC Pressure Water Pipe.
   c. UBPPA UNI-B-13 Standard Performance Specification on joined restrained devices for use with Poly Vinyl Chloride (PVC) Pipe.
7. Underwriters Laboratories Inc. (UL):
   a. UL 246 Hydrants for Fire-Protection Service.
   b. UL 262 Gate Valves for Fire-Protection Service.
   c. UL 312 Check Valves for Fire-Protection Service.
   d. UL 789 Indicator Posts for Fire-Protection Service.
8. National Pollutant Discharge Eliminations System (NPDES):
   a. Comply with storm water requirements of general permit for storm water discharges when flushing pipe systems including storm drains and maintaining logs.

B. Provide all valves from the same manufacturer.

C. No pipe, pipe fitting, or any other fitting or fixture intended to convey or dispose water for human consumption for drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of Assembly Bill AB1953. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25%.

1.04 PRODUCT HANDLING

A. Store items above ground on platforms, skids, or other required supports.

B. Protect materials from direct sunlight.

C. Protect coating and linings on piping, fittings, and accessories from damage. Repair and/or replace damaged coatings or linings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe:
   1. Pipe sizes up to 2.5 inches shall be copper water tubing, Type L hard, ANSI H23.1, ASTM B 88, IAPMO IS. Muller Brass, Cambridge-Lee Halstead, or equal.
   2. If soil report indicates corrosive condition, an approved protective wrap shall be used to completely isolate and protect all underground copper tubing and extend past the surface a minimum 12 inches. The excess wrapping shall be trimmed down and taped to copper tubing with 10 mill PVC pipe tape at grade level of concrete or asphalt.
   3. Underground pipe sizes 3 inches and larger shall be PVC water main pipe material complying with ASTM D 1784 Cell Class 12454B and AWWA C900. Piping shall be plain end or gasket bell end, pressure class 200 (DR14) with cast iron pipe equivalent OD.
   4. Stainless steel pipe, sizes 2 inch and larger may be used above or below ground with the approval of the Architect in lieu of copper, ductile iron, or plastic. Stainless steel pipe shall be schedule 10 or 304 above ground and schedule 316 below ground conforming to ASTM A312. Flanges shall be HR carbon steel plated conforming to ASTM A36. Flange exterior coating shall be Zink plated conforming to ASTM B633- 85.Welding wire/rod shall be 308L SS wire rod conforming to ASME SF A5.9.
      a. Underground connections shall be welded s. s. pipe or made with a welded flange connection. Above ground connections may be with either flange or grooved Victaulic type coupler. Victaulic couplers shall be classified according to ANSI/NSF 61.

B. B. Poly Vinyl Chloride (PVC) Water Main Fittings shall be gray-iron or ductile iron conforming to AWWA C110/A21.10 or AWWA C153/A21.53 and shall have cement mortar lining conforming to AWWA C104/A21.4, standard thickness unless otherwise indicated on Drawings. Fittings shall be mechanical joints.

2.02 PVC JOINTS AND JOINTING MATERIALS:

A. Pipe joints shall be push on as specified in ASTM D 3139.

B. Joints between pipe and metal fittings, valves, and other accessories shall be mechanical joints as specified in AWWA C111/A21.11.

C. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling installation.

D. Gaskets for push on joints for pipe shall conform to ASTM F 477.

E. Gaskets for push on joints and compression type joints or mechanical joints for connections between pipes and metal fittings, valves, and other accessories shall be as specified in AWWA C111/A21.11.

F. Sleeve-type mechanically coupled joints may be provided instead of push- on joints on plain-end PVC plastic joints. Comply with requirements of ASTM D 3139.

NOTE: Gate vales in a domestic plumbing system intended to convey water for human consumption shall comply with quality assurance, article 1.03C of this specification.

2.03 GATES VALVES FOR PVC:

A. Non-rising stem type with resilient wedge gates or iron body bronze wedge gates and mechanical joint ends conform to AWWA C500.

B. Non-rising stem type with mechanical joints ends shall conform to AWWA C509.

C. Valves designed for a working pressure of 175 psi shall be inside-screw type with operating nut, and resilient wedge type gate. Valve shall be provided with mechanical joints as required for the pipe to which it is intended to connect.

D. Valves with UL listing of 262 shall conform to AWWA C500. Valves shall open by counter-clockwise rotation of valve stem.

E. Stuffing boxes shall be provided with O-ring stem seals and shall be bolted and constructed to permit easy removal of parts for repair.

F. Sleeve type mechanical couplings may be provided instead of mechanical and push on joint ends.

G. Valve ends and gaskets for connection to sleeve type mechanical couplings shall conform to specified requirements for the joint or coupling.
   1. Gate Valves in Valve Pits:
   2. Outside screw and yoke rising stem type valves with resilient wedge gates and flanged ends shall conform to AWWA C500.
   3. Outside screw and yoke rising stem type valves with flanged ends shall conform to AWWA C509.
   4. Outside screw and yoke type Valves with double disc gates or split- wedge type gate and flanged ended ends shall be designed for 175 psi and conform to UL 262.
   5. Provide valves with hand wheels that open by counterclockwise rotation of the valve stem.
   6. Stuffing boxes shall be provided with O-ring stem seals and shall be bolted and constructed to permit easy removal of parts for repair.
   7. Check Valves for PVC:
   8. NOTE: Check valves in a domestic plumbing system intended to convey water for human consumption shall comply with quality assurance, article 1.03C of this specification.
   9. Valves shall be swing-check type conforming to AWWA C508 or UL 312.
   10. Valves shall be provided with cast iron or steel body and cover, flanged ends and clear port opening.
   11. Valves shall be designed for a working pressure of 175 psi.
   12. Fire Hydrants:
   13. Before procurement, verify approval issued by the County of San Bernardino or Fire Department having jurisdiction.
   14. Hydrants shall be wet barrel types conforming to AWWA C503 or UL 246.
   15. Only 1¾ inch pentagonal nuts are to be provided on stems and protective caps.
   16. Specified hydrants:
   17. Clow/Rich # 850 or 860
   18. James Jones #J3700 Fluted Barrel
   19. LB Ironworks #702 Lido or 425
   20. Valve Boxes: 14-3/4”x20”x12” cast concrete with cast iron, traffic grade
   21. cover marked “WATER” (for use over water valves).
   22. Brooks 36-H MB w/ No. 36-T cast iron cover EISEL 363.5.

H. Mechanical Thrust Restraint:
   1. Restraint shall be incorporated into the follower gland.
   2. Restraint shall consist of individually actuated wedges that increase resistance to pull out as internal pressure or external forces increase.
   3. Gland shall be ductile iron conforming to ASTM A 536.
   4. Provide twist off nuts and tee-head bolts of the same size to ensure proper actuating of restraint devices.
   5. Restraining device shall be provided with pressure rating equal to that of the pipe on which it is installed.
   6. Restraining gland shall be UL listed.
   7. Mechanical thrust restraint devices shall be EBAA Iron “Megalug”, or equal.

I. Restraint Device Adapters:
   1. Restrained flange adapters shall be provided instead of threaded or welded flange spool pieces on plain end of ductile iron or PVC pipe.
   2. Flange adapters shall be manufactured of ductile iron conforming to ASTM A 536 and be provided with flange bolt circles compatible with ANSI/AWWA C115/A21.15.
   3. Restraint of flange adapter shall consist of a multiple number of individually actuated gripping wedges to maximize restraint capability.
      a. Torque limiting actuating screws shall be provided to insure proper initial set of gripping wedges.

1) Flange adapter shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow at least 0.6 inch of gap between end of pipe and mating flange without affecting integrity of seal.
   (a) Flange adapter shall be provided with a safety factor of at least 2:1 for rated pressure.
      (1) Restraint device adapters shall be EBAA Iron “Megaflange”, or equal.
      (2) Tracer Wire for Nonmetallic Pipes: Tracer wires shall be electrically
      (3) continuous #14 copper tracer wire, Type TW, blue plastic covered for domestic water and red for fire sprinkler. (Aluminum wire is prohibited). Provide in sufficient length to be continuous over each installed section of nonmetallic pipe.
      (4) Pipe markers shall be a concrete plaque inscribed with the word “WATER.”
      (5) Water Service Line Materials:
      (6) Copper Tubing: Copper tubing shall conform to ASTM B 88, Type L.
      (7) Fittings for Copper Tubing: Fittings for solder-type joints shall conform to ANSI B16.18 or ASME/ANSI B16.22. Fittings for compression-type joints shall conform to ASME/ANSI B16.26, flared tube type.
      (8) Water Service Line Appurtenances:
      (9) Corporation stops shall be ground key type; manufactured of bronze conforming to ASTM B 61 or ASTM B 62; and suitable for the working pressure of the system. Ends shall be suitable for solder- joint or flared tube compression type joint connection. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nut for connection to flared copper tubing and shall conform to ASME/ANSI B16.26.
      (10) Goosenecks shall be type K copper tubing. Joint ends for goosenecks shall be as required for connecting to corporation stop and service line. Where multiple gooseneck connections are required for individual service, connect goosenecks to service line through brass or bronze branch connection; the total clear area of branches shall be at least equal to clear area of service line. Length of goosenecks shall be as indicated or required.
      (11) Curb or service stops shall be ground key, round way, inverted key type; bronze, conforming to ASTM B 61 or ASTM B 62; and rated at 150 psi. Ends shall be as required for connection to service piping. Arrow shall be cast into body of curb or service stop indicating direction of flow.
      (12) a. Gate valves 2.5 inches and larger shall be MSS SP-80, Class 150, solid wedge, or resilient wedge gate, and non-rising stem. Valves shall be provided with flanged end connections. Provide hand wheel operators if easily accessible. Provide operating nut if inside a vault, pit or valve box.
      (13) Gate valves in valve pits 2 inches, and smaller shall be MSS SP- 80, Class 150, bronze, solid wedge, inside screw, rising stem. Valves shall be provided with flanged end connections or threaded end connections with union on one side of valve and hand wheel operator.
      (14) Valve boxes shall be provided at each gate valve installed underground. Valve boxes shall be a size suitable for valve on which it is installed.
      (15) Water meter indicated on Drawings will be installed by water purveyor for the area, unless noted otherwise.
      (16) Strainers:
      (17) STR-1 Description: Wye type with monel or stainless steel strainer cylinder (manufacturer’s standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe

valve) blow out piping, same size as blow out plug:

(18) 2” and smaller: C.M. Bailey #100-A, bronze, 250 lb., or ductile iron with fusion bonded epoxy coating.
(19) 2 1/2” and larger: Watts 77F-DI-FDA-125 lb., or other ductile iron fusion bonded epoxy coated flanged strainer, conforming to ASTM A-
(20) 312 for the strainer body, and ASTM A-240 for the stainless steel strainer element. (No iron body strainer shall be used on potable water that is not fusion bonded epoxy coated inside and out.)
(21) C.M.BAILEY ARMSTRONG WILKINS WATTS
(22) STR-2 “Y” pattern, cast iron bodies, 125 psi, monel screen 16 sq. mesh. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2”, flanged ends for 2 ½” and larger perforations, in accordance with the following:
(23) BAILEY #100 ARMSTRONG RP & C KECKLEY
(24) STR-3 Bucket type, flange, semi-steel body, 125 psi, stainless steel screen with 1/8” diameter perforations (mounted above grade for water service). All sizes, (for mains serving fire sprinkler risers):
(25) BAILEY #1 ZURN 150 Series RP 7 C WATTS 97FB- FSFE
(26) STR-42” and larger: Watts 077-F-SS Stainless steel flange type strainer, or equal conforming to ASTM A-312 for strainer body, ASTM A-240 for the SS strainer element and ASTM A-36 for base flange material.

J. Backflow Preventer Assemblies:
1. Assembly shall be provided with flanged connections, ductile iron with fusion bonded epoxy coated construction, bronze, or stainless steel.
2. Backflow preventer shall be suitable for cold water working pressure of 175 psi.
3. Internal parts shall be designed for replacement without removing valves from line.
4. Double check backflow preventer assembly shall consist of two independently acting spring cam or poppet style check valves, 2 shut- off valves and 4 test cocks. Check valve shall be designed to provide drip tight closure against reverse flow, low pressure drop at maximum flow capacity. Spring-loaded checks shall cause valve to seal against a higher inlet pressure than outlet pressure when there is no flow.
5. Double check backflow preventer assembly shall meet AWWA Standard C510-89.
   a. Assembly shall be:
   b. Ames 2000ss Febco 850 Watts 709 Wilkins 350, or equal.
      1) Reduced pressure backflow preventer assembly shall consist of two check valves located between two shut-off vales with an area of reduced pressure between two check valves and a relief device arranged to discharge to atmosphere.
         (a) Comply with AWWA Standard C511.
            (1) Fluctuation in piping pressure shall not cause cycling. Backflow preventer shall automatically maintain low pressure zone to positively prevent backflow of water into system. Assembly shall automatically indicated failure of any part vital to backflow prevention by the continuous discharge relief device.

K. Reduced pressure backflow preventer assembly shall be Cla-Val Model RP-4, or equal.
1. Backflow prevention assemblies (devices), shall be tested and certified by a certified backflow tester, and a test report shall be provided to the water agency having jurisdiction. Testing shall be performed in the presence of the PI.

PART 3 – EXECUTION

3.01 3.01 EXCAVATION, BACKFILLING AND COMPACTING

(CONFORM TO REQUIREMENTS IN SECTION 31 23 00 - EXCAVATION, BACKFILLING AND COMPACTION)

1. Project site water lines shall terminate approximately 5 feet from buildings, unless otherwise indicated on Drawings. Temporarily cap or plug terminals for future connection to building.
2. CLEARANCES OF WATER LINE
   a. Building or Structures: 2 feet.
   b. Parallel to Sewer Line:
      1) Water line 4 inches or less in diameter shall not be installed in a common trench with the building sanitary drain unless the bottom of the water line is at least 12 inches above the top of the building sanitary drain or where the water line is installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the building sanitary drain.
      2) Water mains 6 inches and larger in diameter shall be separated from the Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, in accordance with the requirement of the State of California, Human and Welfare Agency, Department of Health Services.
         (a) Crossing Sewer Line:
            (1) A water main shall be separated from sanitary sewer in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2), unless modified herein.
            (2) Install water main a minimum of 12 inches clear, above or below a sanitary sewer.
            (3) 3. A water main 6 inches or greater in diameter, crossing under a Project site sanitary sewer line, shall be installed with all their joints located at least 10 feet away from each side of the sanitary sewer line.
            (4) A water main 6 inches or greater in diameter, crossing over a Project site sanitary sewer line, shall be installed with all their joints located at least 4 feet away from each side of a purple pipe or sanitary sewer line.
            (5) Install all water mains no closer than 10 feet horizontally clear from the edge of sewage leach fields, seepage pits, and septic tanks.

B. PIPE INSTALLATION AND JOINING
   1. Remove fins and burrs from pipe and fittings.
   2. Clean piping, fitting, valves, and accessories before installing. Maintain items in a clean condition.
   3. Provide proper facilities for lowering sections of pipe into trenches. Do not drop into piping, fittings, or other materials into trenches. Accurately cut pipe and install without springing or forcing. Replace any piping or fitting that does not provide sufficient space for proper installation of joining material.
   4. Blocking or wedging between bells and spigots is not permitted. Install bell and spigot pipe with bell end pointing in the direction of flow.
   5. Install piping to the lines and grades indicated or required. Low points and dips are not permitted. Support piping at proper elevation and grade with secure and uniform supports. Wood support blocking is not permitted. Where sand cement slurry will not be furnished for backfill, install piping so that full length of each section of pipe and each fitting will solidly rest on pipe bedding. Excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated or required for installation. Provide proper allowances and devices for expansion and contraction of piping and systems.
   6. Maintain trenches free of standing water until pipe joints have been installed.
   7. At the end of each day close open ends of pipe with temporary caps of the same material as the pipe.
   8. Do not install piping when trench or weather conditions prevent proper installation.

C. INSTALLATION OF TRACER WIRE AND PIPE MARKERS
   1. Tracer Wire: Install continuous length of tracer wire for full length of each run of nonmetallic pipe. Fasten wire to top of pipe in such a manner that it will not be displaced

during construction operations. Wire shall be fastened to pipe at not greater than 20-foot intervals. Wire shall terminate above finished grade with a

a. 12 inch lead taped around each riser. Provide a tracer wire to grade under a permanent marker where straight-line transitions of metallic to non-metallic pipe are installed.
    1) Underground Pipe Markers: Provide markers at grade where non-metallic pipe is installed and for each horizontal change in direction.
        (a) CONNECTIONS TO EXISTING WATER LINES
            (1) After PI has inspected installation, perform connections to servicing water lines. Schedule service shutdown for connecting new system at a time causing minimum disruption.
            (2) Use a tap or drilling machine with valve and mechanical joint type sleeves for connections to waterlines under pressure, only if all other means of scheduling a shutdown time have been unsuccessful, and with the approval of the responsible engineer, and PI.
            (3) Bolt sleeves around mains; bolt valve conforming to AWWA C500 to branch. Open valve, attach drilling machine, perform tap, close valve, and remove drilling machine, without interruption of service. Notify the PI in writing at least 5 days prior to the date of scheduled connections.
            (4) INSTALLATION OF PVC PLASTIC WATER MAINS
            (5) Unless otherwise indicated, install pipe and fittings as specified and in accordance with UBPPA UNI-B-3 and AWWA M23, Chapter 7, “Installation”.
            (6) Jointing:
            (7) Provide push on joints with elastomeric gaskets specified for this type of joint, furnishing either elastomeric-gasket bell-end pipe or elastomeric- gasket couplings. For pipe-to-pipe push on joint connections, provide pipe with push on joint ends furnished with factory installed bevel; for push on joint connections to metal fittings, valves and other accessories, square cut spigot end off pipe end.
            (8) Provide push on joint lubricant recommended by manufacturer.
            (9) Install push on joints for pipe-to-pipe connections in accordance with UBPPA UNI-B-3 and AWWA M23, Chapter 7, "Installation."
            (10) Install push on joints for connection to fittings, valves, and other accessories in accordance with requirements of UBPPA Uni-B-3 and with applicable requirements of AWWA C600.
            (11) Compression-type joints/mechanical-joints with gaskets, glands, bolts, nuts and internal stiffeners shall be installed in accordance with the requirements of UBPPA UNI-B-3 and AWWA C600 and Appendix A to AWWA C 111/A21.11.
            (12) Square cut spigot off end of pipe for
            (13) compression-type joint/mechanical-joint connections and do not re-bevel.
            (14) Sleeve-type mechanical couplings shall be provided in strict accordance with coupling manufacturer’s recommendations using internal stiffeners as specified for compression-type joints.

D. PROVIDE MECHANICAL THRUST RESTRAINT DEVICES FOR ANCHORAGE AND PIPING UNLESS THRUST BLOCKS ARE INDICATED ON THE DRAWINGS. THRUST BLOCKS SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF UBPPA UNI-B-3 EXCEPT THAT SIZE AND LOCATION OF BLOCKS SHALL BE AS INDICATED. THRUST BLOCKS SHALL BE PROVIDED AS SPECIFIED IN SECTION 32 12 17: SITE CONCRETE PAVING.

3.02 INSTALLATION OF VALVES

A. PROVIDE GATE VALVES CONFORMING TO AWWA C 500 AND UL 262 IN ACCORDANCE WITH AWWA C600 FOR VALVE AND FITTING INSTALLATION AND WITH

RECOMMENDATIONS OF AWWA C500 APPENDIX “INSTALLATION, OPERATION, AND MAINTENANCE OF GATE VALVES”.

B. PROVIDE GATE VALVES CONFORMING TO AWWA C 600 IN ACCORDANCE WITH AWWA C 509 FOR VALVE AND FITTING INSTALLATION AND WITH RECOMMENDATIONS OF AWWA C 500 APPENDIX “INSTALLATION, OPERATION, AND MAINTENANCE OF GATE VALVES”.

C. PROVIDE GATE VALVES ON PVC WATER MAINS IN ACCORDANCE WITH AWWA M23 CHAPTER 7, “INSTALLATION.”

D. PROVIDE CHECK VALVES AND FITTINGS IN ACCORDANCE WITH APPLICABLE REQUIREMENTS OF AWWA C600 UNLESS NOTED OTHERWISE ON THE DRAWINGS.

E. PROVIDE GATE AND CHECK VALVE JOINTS AS SPECIFIED FOR THE TYPE OF JOINTS BETWEEN PIPE AND FITTINGS.

3.03 INSTALLATION OF HYDRANTS

A. INSTALL HYDRANTS ACCORDING TO REQUIREMENTS OF AWWA C 600 FOR HYDRANT INSTALLATION AND AS INDICATED. PROVIDE JOINTS AS SPECIFIED FOR THE TYPE OF JOINTS BETWEEN PIPE AND FITTINGS.

B. INSTALL HYDRANT WITH A 6-INCH KEY GATE VALVE BETWEEN 4 AND 10 FEET FROM THE HYDRANT.

3.04 INSTALLATION OF BACKFLOW PREVENTERS

A. INSTALL REDUCED PRESSURE BACKFLOW PREVENTERS TO COMPLY WITH THE LOCAL AUTHORITY HAVING JURISDICTION.

B. WATER SERVICE LINE CONNECTION TO WATER MAINS
   1. Connect service line to main by corporation stop and gooseneck. Install service stop as indicated on the Drawings. Connect service lines to PVC plastic water mains in accordance with UBPPA UNI-B8 and AWWA M23, Chapter 9, “Service Connections”.
   2. Special Requirements for Plastic Piping: Unless otherwise indicated, install pipe and fittings in accordance with ASTM D 2774 and ASTM D 2855. Handle solvent cements for plastic pipe jointing in accordance with ASTM F 402. Install joints according to ASTM D 2855. Install other joints to materials other than pipe materials in accordance with plastic pipe manufacturer’s recommendations.
   3. Connect plastic pipe service lines to corporation stops and gate valves according to plastic pipe manufacture’s recommendations.
      a. INSTALLATION OF STRAINERS:
         1) Strainers shall be installed on each water main downstream of the meter, above grade at the pressure regulating station. When a pressure regulating station (assembly) is not provided, “wye” type flange strainer shall be provided, with a shut off valve on the inlet and the outlet side.
            (a) If the water main is serving fire sprinkler risers or hydrants, then an approved fire service strainer shall be used: Watts 97DB-FSFE or equal.
         2) DISINFECTION OF DOMESTIC WATER PIPING SYSTEM
            (a) When water piping has been installed and tested, sterilize system before use and/or Substantial Completion.
            (b) Inject solution of liquid chlorine or sodium hypochlorite and water containing at least 50 PPM of free chlorine into a system in a manner to ensure that entire system is completely filled with solution. During this procedure operate valves and test outlets for residual chlorine. Continue injection until outlets indicate at least 59 PPM of free chlorine.
            (c) After injection, isolate system and hold solution in retention for a period of at least 8 hours. Perform tests for residual chlorine after retention. If such tests indicate less than 50 PPM of residual chlorine, repeat entire procedure. After satisfactory sterilization has been verified, flush entire system until all traces of chlorine have been removed or until chlorine content is no greater than in existing water supply.

3) ELECTROLYSIS PREVENTION
   (a) A minimum 6 inch long brass nipple shall be installed at locations specified or as required. Flanges shall be provided with a complete insulating component consisting of; gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at locations indicated or as required. Dielectric fittings are prohibited.
   (b) Where steel or cast iron below grade connects to copper or brass piping above grade, the transition from steel or cast iron pipe to copper or brass pipe shall be installed in an above grade accessible location.
   (c) Underground connections between dissimilar metals shall be in accessible yard boxes.
   (d) Above ground dielectric connections shall be exposed.
   (e) ABANDONING WATER LINES AND STRUCTURES
   (f) Water lines and all appurtenances to be abandoned in place shall be cut and removed from all areas where new Work is being installed.
   (g) Cap or plug abandoned existing drain lines below grade in a yard box and according to UPC.
   (h) TESTS AND INSPECTIONS
   (i) Provide labor, equipment, materials, test equipment and incidentals required for performing required field tests.
   (j) Tests shall not be performed for 5 days after concrete thrust blocks have been installed.
   (k) Testing Procedure: Water mains and service lines shall be tested in accordance with applicable specified standard.
   (l) Test PVC plastic water system in accordance with UBPPA UNI-B-3 for pressure and leakage. The amount of leakage from PVC piping shall not exceed the amounts given in UBPPA UNI-B-3, except that no leakage is permitted for joints installed with sleeve type mechanical couplings.
   (m) Test water service lines in accordance with applicable requirements of AWWA C 600. No leakage is permitted.
   (n) Pressure testing: Before pressure test, fill portion of piping being tested with water for a minimum of 24 hours. Provide hydrostatic pressure of at least 50 psi greater than the maximum working pressure of tested system, but no less than 200 psi hydrostatic test pressure for system piping of 2 inches in diameter and larger. Provide and maintain hydrostatic test pressure for at least 2 hours to ensure no leakage of any portion of piping or appurtenances under pressure test.

END OF SECTION

SECTION 33 31 13
SANITARY SEWAGE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site sanitary drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to site sanitary sewers.

C. Connection of site sanitary drainage system to municipal sewers.

D. Manhole access and cleanout access.

E. Extent of sanitary sewage systems work is indicated on drawings and schedules, and by requirements of this section.

F. Refer to Division-3 Sections for concrete work required for sanitary sewage systems; not work of this section.

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with sanitary sewage work similar to that required for project.

C. Codes and Standards:
1. Comply with UBC Chapter 9A (latest adopted addition).
2. Comply with the applicable portions of the UBC Chapter 33 (latest adopted addition).
3. Comply with the applicable portions of CBC including CCR, Title 24, Volume 2, Part 2, Chapter 33 (latest adopted addition).
4. Coordinate work of this Section with Permit provisions of the State of California Water Resources Control Board Order Number 92-08-DWQ.
5. The Owner’s Storm Water Pollution Prevention Plan.
6. California Plumbing Code (latest adopted edition) CCR Title 24, Volume 3, Part 5.
7. Cal-OSHA.
8. OSHA.
9. ANSI A21.10
10. AWWA Publications regarding pipe and installation;
    a. AWWA C 110.
    b. AWWA C 111.
    c. AWWA C 115.
    d. AWWA C 151.
    e. AWWA C 153.
    f. AWWA C 214
    g. AWWA C 503.
    h. AWWA C 509.
    i. AWWA C 511.
    j. AWWA C 600.
    k. AWWA C 651.
    l. AWWA C 900.
    m. AWWA C 901.
    n. UNI - B - 3 with AWWA C 900.
11. American Society for Testing and Material publications;
    a. ASTM C12 - Practice for Installing Vitrified Clay Pipe Lines.
    b. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
    c. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
    d. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.

e. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
f. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
g. ASTM D2774 - Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.
h. ASTM D3034 - Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

12. Sewer Purveyor Compliance: Comply with requirements of City of Fontana Public Works Department supplying sewer connections to project, obtain required permits and inspections.
13. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewage system's materials and products.
14. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewage systems.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for sewage system materials and products.

B. Record Drawings: At project close-out, submit record drawings of installed sanitary sewage piping and products, in accordance with requirements of Division 1.

C. Maintenance Data: Submit maintenance data and parts lists for sanitary sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.

PRODUCTS

1.04 IDENTIFICATION

A. Underground-Type Plastic Line Markers: Manufacturer's standard permanent, bright- colored, continuous-printed plastic tape, intended for direct-burial service; metallic- lined, not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION - SEWER LINE BURIED BELOW".
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work include, but are not limited to, the following:
   2. Manufacturer: Subject to compliance with requirements, provide identification markers of one of the following:
      a. Terra Tape Sentry Line 1350
      b. Allen Systems, Inc.
      c. Emed Co., Inc.
      d. Seton Name Plate Corp.

1.05 PIPES AND PIPE FITTINGS

A. General: Provide pipes of one of the following materials, of weight/class indicated on civil engineers plans. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

B. Vitrified Clay Pipe: ASTM C 700, bell and spigot ends, standard strength unless otherwise indicated.
   1. Fittings: Vitrified clay bell and spigot, same strength as adjoining pipe, compression joints complying with ASTM C 425.

C. Polyvinyl Chloride (PVC) Sewer Pipe: ASTM D 3033, Type PSP, SDR 35; or ASTM D 3034, Type PSM, SDR 35.
   1. Fittings: PVC, ASTM D 3033 OR ASTM D 3034, solvent-cement joints complying with ASTM D 2855 using solvent cement complying with ASTM D 2564; or elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.

D. Polyvinyl Chloride (PVC) DWV Pipe: Schedule 80, ASTM D 2665.

1. Fittings: PVC Schedule 80, ASTM D 2665; solvent-cement joints, ASTM D 2664; or threaded joints.

1.06 SANITARY SEWER MANHOLE

A. General: Provide pre-cast reinforced concrete sanitary manholes as indicated, and complying with ASTM C 478.

B. Top: Pre-cast concrete, of concentric cone, eccentric cone, or flat slab top type, as indicated.

C. Base: Pre-cast concrete, with base riser section and separate base slab, or base riser section with integral floor, as indicated.

D. Steps: Ductile-iron or aluminum, integrally cast into manhole sidewalls.

E. Frame and Cover: Ductile-iron, 26" diameter cover, heavy-duty, indented top design, with lettering cast into top reading "SANITARY SEWER".

F. Pipe Connectors: Resilient, complying with ASTM C 923.

1.07 CLEANOUTS

A. A. General: Provide as indicated, pipe extension to grade with ferrule and countersunk cleanout plug. Provide round cast-iron access frame over cleanout, with heavy-duty secured cover with lifting device.

PART 3EXECUTION

3.01 EXAMINATION

A. Verify that trench cut is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material or sand.

B. Remove large stones or other hard matter, which could damage drainage pipe or impede consistent backfilling or compaction.

C. Install bedding as specified in Section 31 23 17 – “Excavation Backfilling and Compaction for Structures”.

3.03 INSTALLATION OF IDENTIFICATION

A. A. General: During back-filling/top-soiling of storm drainage systems, install continuous metallic lined underground warning tape, located directly over buried line at 6" to 8" below finished grade. Tape shall be polyethylene with metallic core, 6 inches wide by 4 mils thick, solid green color with continuously printed caption in black letters “CAUTION – SEWER LINE BURIED BELOW.”

3.04 INSTALLATION OF PIPE AND PIPE FITTINGS

A. General: Install piping in accordance with Section 306, of the Standard Specifications for Public Works Construction. Seal joints water tight.

B. Surveyor Qualifications
   1. Surveyor shall currently be licensed in the State of California as a Professional Land Surveyor.
   2. Surveyor shall employ proper field procedures, instrumentation and adequate survey personnel in order to achieve accuracies as required by each section.
   3. Cut sheets, if required, shall be provide to the Inspector of Record.

C. Sanitary Sewer Staking:
   1. Stakes shall be located with positional accuracies of a minimum of 0.04 feet horizontally and 0.01 feet vertically.
   2. One set of construction stakes with lath shall be set. Lath shall indicate offset, cut/fill, and reference point.

3. Stakes shall be provided for sewer lines at a maximum interval of 25 feet, grade breaks, angle points, manholes, cleanouts, clarifiers and building points of connection.
4. Construction stakes shall be offset to the side of the utility at a distance from centerline designated by contractor and agreed to by surveyor prior to commencement of staking.
5. Surveyor shall provide to the Project Inspector cut sheets for all staking. The contractor shall not commence work until the Project Inspector has been provided copies of said cut sheets.
6. All stakes shall be preserved in place until such time that the Project Inspector has approved utility installation for backfilling.
7. All utilities to be installed at slopes less than 0.01 feet per foot shall be certified by the construction surveyor. Written certification shall be provided to the Project Inspector and the Owner Authorized Representative (OAR).
8. Should a dispute arise over the position of the utility in question and the stakes provided for said installation are removed, destroyed, or disturbed, the contractor assumes full responsibility for all cost associated with the resolution of the dispute.

D. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

E. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.

F. Place bell ends or groove ends of piping facing upstream.

G. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

H. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

I. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.
1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.
3. Flush lines between manholes if required to remove collected debris.

J. Joint Adaptors: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

K. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

L. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2' of backfill is in place, and again at completion of project.
1. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect.

M. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods for size and type material being closed. Wood plugs are not acceptable.

3.05 SANITARY MANHOLES AND CLEANOUTS

A. General: Place pre-cast concrete sections as indicated. Where manholes and cleanouts occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 2" above finish surface, unless otherwise indicated.

B. Spacing of manhole and cleanouts shall be a minimum as indicated by the Uniform Plumbing Code.

C. Form bottom of excavation clean and smooth to correct elevation.

D. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections

E. Install in accordance with ASTM C 891.

F. Provide rubber joint gasket complying with ASTM C 443 at joints of sections.

G. Apply bituminous mastic coating at joints of sections.

H. Establish elevations and pipe inverted for inlets and outlets as indicated.

I. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.06 TAP CONNECTIONS

A. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.

B. Use commercially manufactured wyes for branch connections. Field cutting into piping will not be permitted. Spring wyes into existing line and encase entire wye, plus 6" overlap, with not less than 6" of 3,000-psi 28-day compressive strength concrete.

C. Branch connections made from side into existing 4" to 21" piping shall have wye sprung into existing line, and entire wye encased with not less than 6" of 3,000 psi 28-day compressive strength concrete.

D. Take care while making tap connections to prevent concrete or debris from entering existing piping or structure. Remove debris, concrete, or other extraneous material, which may accumulate.

E. Contractor shall be responsible for all coordination with the City of Fontana Public Works Department connections to be made to City mains.

3.07 BACKFILLING

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

B. Request inspections by project Geotechnical Laboratory during all backfill operations.

C. To minimize local area traffic interruptions, allow no more than 100' between pipe laying and point of complete backfilling.

D. Place pipe on bedding as specified in Section 31 23 17 – “Excavation Backfilling and Compaction for Structures”.

E. Install bedding at sides and over top of pipe. Provide top cover to minimum compacted thickness of 12 inches.

F. Place bedding in maximum 8 inch lifts.

3.08 FIELD QUALITY CONTROL

A. Testing: Perform pressure testing of completed piping in accordance with the provisions of the project specifications prior to backfilling.

B. Video Inspection: The prime plumbing contractor shall submit to the Architect within 35 days after the start of construction, the name of an independent sub-contractor that will provide the inspection by video recording on digital video disk (DVD) the installed sanitary sewage system. The inspection and video recording shall commence only after all underground utilities have been installed, and all excavation has occurred. The inspection and video recording shall commence only after all pipes have been flushed with clean water so that any presence of ponding shall be easily identified. The District shall be notified at least 24 hours prior to the video inspection to give the District Maintenance personnel the option of attending the inspection/video recording. The sub-contractor providing the video inspection shall provide the construction manager/prime plumbing contractor and owner one copy each of the DVD.

C. A written narrative shall accompany the DVD with documentation of any irregularities encountered, such as debris in the lines, broken lines, lines that indicate negative slopes by the presence of ponding, lines not installed per the project specifications, and verification of cleanouts and pipe routing for compliance with the approved civil engineers plans.

D. The video recording and written narrative shall be provided to the District at the expense of the contractor.

E. The contractor shall correct any and all irregularities identified by video detection at no cost to the District. The prime plumbing contractor shall conduct a new video inspection of those lines

repaired, replaced, or realigned at no cost to the District.

3.09 TESTING

A. After installation, test each sanitary drain and/or sewer and each section between successive manholes, for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306-Underground conduit Construction of the Standard Specifications for Public Works Construction.

B. Where excessive ground water is encountered test the pipeline for infiltration.

C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the

D. required limits.

3.10 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.11 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Provisions of Division 01 apply to this section.

B. Section Includes:
   1. Catch basins, grates and frames; culverts; curb inlets; drainage pipes; sub-surface drains; manhole covers and frames; surface run-off collection or infiltration.

C. Definitions:
   1. BMP: Stormwater Best Management Practice.
   2. Post Construction BMP's: Devices installed by the Contractor for storm water management to be left on site after construction completion.
   3. SWPPP: Storm Water Pollution Prevention Plan.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.

B. Product Data: Manufacturer's catalog data for all required materials. Include technical data for accessories, information concerning gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.

D. Closeout Documents: Submit the following documents to the OAR at Substantial Completion:
   1. Maintenance Log: Maintenance and upkeep records of the installed Post Construction BMP's. Provide in electronic MS Excel Sheet including the following headers as a minimum: "Date of Service", "Location of BMP", "Type of Maintenance or Service", "Notes", "Next Scheduled Preventive Maintenance Due", and "Inspector Signature".
   2. Two copies of the latest project SWPPP including Notice of Termination (NOT) from the State Water Board.
   3. Record drawings: As-Built site plan(s) showing the Post Construction BMP's. Provide a copy of marked record set with red pencil identifying any variations from design documents at substantial completion.
   4. Two CD's containing electronic MS Excel Sheet including the following headers as a minimum: "BMP Description", "Location of BMP and Map Grid Location" and "Type of Maintenance or Service Needed", i.e.; weekly, monthly, quarterly, etc. "Stock No.", "Manufacturer Contact Information", along with "Frequency" i.e.; weekly, monthly, quarterly, etc. and "Special Instructions".
   5. Maintenance Manuals: Provide Maintenance Manual for specific storm drainage BMP components installed along with requirements, replacement or maintenance schedule and plans with the location of each BMP component. This manual shall include product information cut sheet, shop drawings, vendor information for each component and warranty.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

1.04 TRAINING OF OWNER PERSONNEL

A. At Substantial Completion and when the storm drainage system is fully operational, knowledgeable representatives from the contractor and manufacturer(s) of various components specified and installed at the site shall provide up to 8 hours of training. Date, time and location for the training shall be coordinated through the project OAR.

B. Training period shall cover but not be limited to the following:
   1. Explain the operation of storm drainage system and its design intent.

2. Explain the maintenance requirements of every component of the system.
3. Provide recommendations of practices to minimize or eliminate negative impact on the system.
4. Provide maintenance schedule as recommended by the manufacturers for every component and review it with M & O staff.
5. Conduct a site walk, identify every component of the system and demonstrate its operation.
6. Training shall be conducted with the use of Maintenance log and Maintenance manual.

C. Provide the following training documentations:
1. Have all District attendees sign off training sheet and provide a copy to the OAR.
2. Provide Operations and Maintenance manuals at the time of training to the Districts staff. The manual shall include only the components that are installed at the site.
3. Upon completion of training, provide a DVD of materials covered in the training and components installed.

D. SURPLUS MATERIALS
1. Provide sufficient additional materials for each component of BMP that requires replacement or service during the first year.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Storm Drain Pipe: Provide in conformance with Section 207 - Pipes and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.

B. Perforated Subsurface Drain Pipe: Provide shop-perforated with perforations symmetrically located within a maximum arc of 160 degrees. Perforations shall provide a total open area of at least 0.3 square inches per linear foot of pipe, with a minimum of one perforation per linear foot, except for joint areas. Perforation shall be either holes or slots. Hole diameters of 1/4 inch minimum to 3/8 inch maximum. Width of slots of 3/16 inch minimum to 5/16 inch maximum with slot length not exceeding 4 inches.

C. Concrete, Mortar and Related Materials: Conform to Section 32 12 17: Site Concrete Paving.

D. Metal Covers, Grates, Frames and Accessories:
1. Conform to Section 206 - Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.
2. Hot-dip galvanize steel parts after fabrication and before installation, in accordance with Section 210 - Paint and Protective Coating of the Standard Specifications for Public Works Construction.
3. Grates and Frames: Vandal-proof design and construction.

E. Filter Material for Subsurface Drain: Non-woven geotextile filter fabric, Mirafi 14ON, or equal.

F. Aggregate Around Perforated Pipe: 6 inches of gravel containing no particles finer than a 3/8 inch to 1/2 inch sieve opening size.

G. Manhole Brick Mortar, Grout, and Plaster: Conform to Standard Specifications for Public Works Construction, Section 202 - Masonry Materials.

PART 3 – EXECUTION

3.01 EXCAVATION, BACKFILLING AND COMPACTING

A. Conform to the requirements of Section 31 23 00: Excavating, Backfilling and Compaction or Section 31 23 16: Excavating, Backfilling and Compaction Pavement, as required.

3.02 INSTALLATION OF PIPE

A. Conform to Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.

B. Non-ferrous drainpipe installed with less than 12 inches of cover to finish grade shall be provided with a 4 inch thick concrete pipe encasement.

3.03 DRAINAGE APPURTENANCES

A. Catch basins, junction chambers, manholes, box culverts, outlet chambers and other drainage structures: Construct as indicated on Drawings and as specified in Section 32 12 17: Site Concrete Paving.

B. Ensure that all Post Construction BMP have a visible identifying manufacturer tag with product identification, manufacturer contact information, date of last service and date of next service due.

C. Provide storm drain stencil per City or County requirements as applicable.

3.04 ABANDONED DRAINAGE LINES AND STRUCTURES

A. Cap or plug existing drain lines that are cut and abandoned and remove existing drainage structures that are abandoned.

3.05 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

B. Maintain Post Construction BMP's after installation and keep a maintenance log to be turned over to OAR at Substantial Completion.

3.06 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION